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EDISON'S NEW STEAM DYNAMO.

In our issue of November 19 we described the Edison system of electrical conductors now being placed beneath the street pavements of New York city. We now present our readers with an engraving of one of the gigantic dynamo-electric machines of the type to be used in supplying the current to the conductors above referred to. This particular machine is an exhibit at the Paris Electrical Exhibition, but it differs but slightly from the others of the same class. The dimensions and weight of this machine are briefly as follows:

Weight of cast iron sole plate upon which dynamo and engine are placed, with pillow blocks, 9,600 lb.; magnets complete, 24,500 lb.; armature complete and shaft, 8,500 lb.; engine, 10,000 lb; total weight 44,600 lb. The total weight of copper on armature and magnets is 3,600 lb. Principal dimensions: sole plate, 12½x8½ feet; length of magnets, 8 feet; length of armature, 5 feet (commutator makes additional length of 9 inches); diameter of armature, 28 inches; engine cylinder, 11 inches by 6 inches; capacity, 2,400 gas jets.

In the Edison system an engine of great power is connected directly with the armature shaft of a single dynamo capable of economically converting the power of the engine into electric energy for distribution to lamps and motors.

The speed of the engine and armature is 350 revolutions per minute. The boiler pressure is 120 lb. With engines of the most perfect build, and with the armature weighing 8,500 lb. as a fly wheel, the Edison machine attains great uniformity in speed and consequently insures perfect steadiness in the light. The armature is arranged on Siemens' principle, the wires being replaced by bars of copper. These bars lie close to each other around the cylinder which forms the armature, and they generate the current. Their extremities are connected with disks of copper laid one against the other at the ends of the cylinder and insulated from each other. Each bar is fastened to its corresponding disks in such a way as to form a single circuit enveloping the cylinder longitudinally, the bars are coupled two-and-two, with the commutator blocks, which are made after the Gramme pattern. Figs. 2 and 3 give an idea of this new arrangement. The center of the cylinder itself outside of the rotating axle consists of a cylinder of wood, which in its turn is surrounded by a thick tube made of a series of very thin disks of iron, separated from each other by tissue paper. This arrangement facilitates the rapid changes of polarity in the plates. This tube is terminated at its two extremities by two thick clamping disks, which are made to compress the others laterally, and the copper disks of the working coil occupy the two compartments at the extremities of the cylinder, as seen in

Fig. 2.

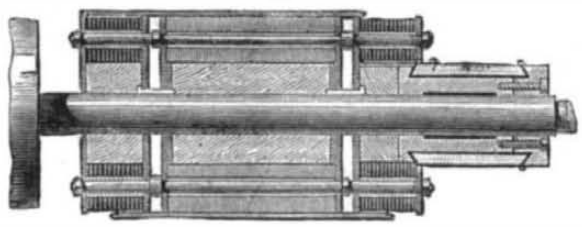
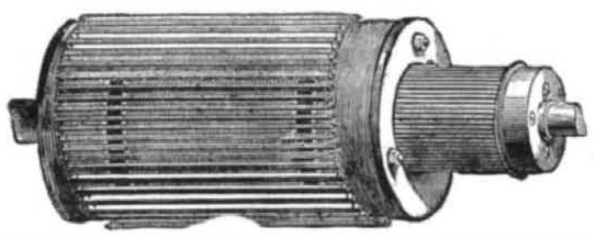


Fig. 3.



SECTIONAL AND PERSPECTIVE VIEWS OF THE ARMATURE.

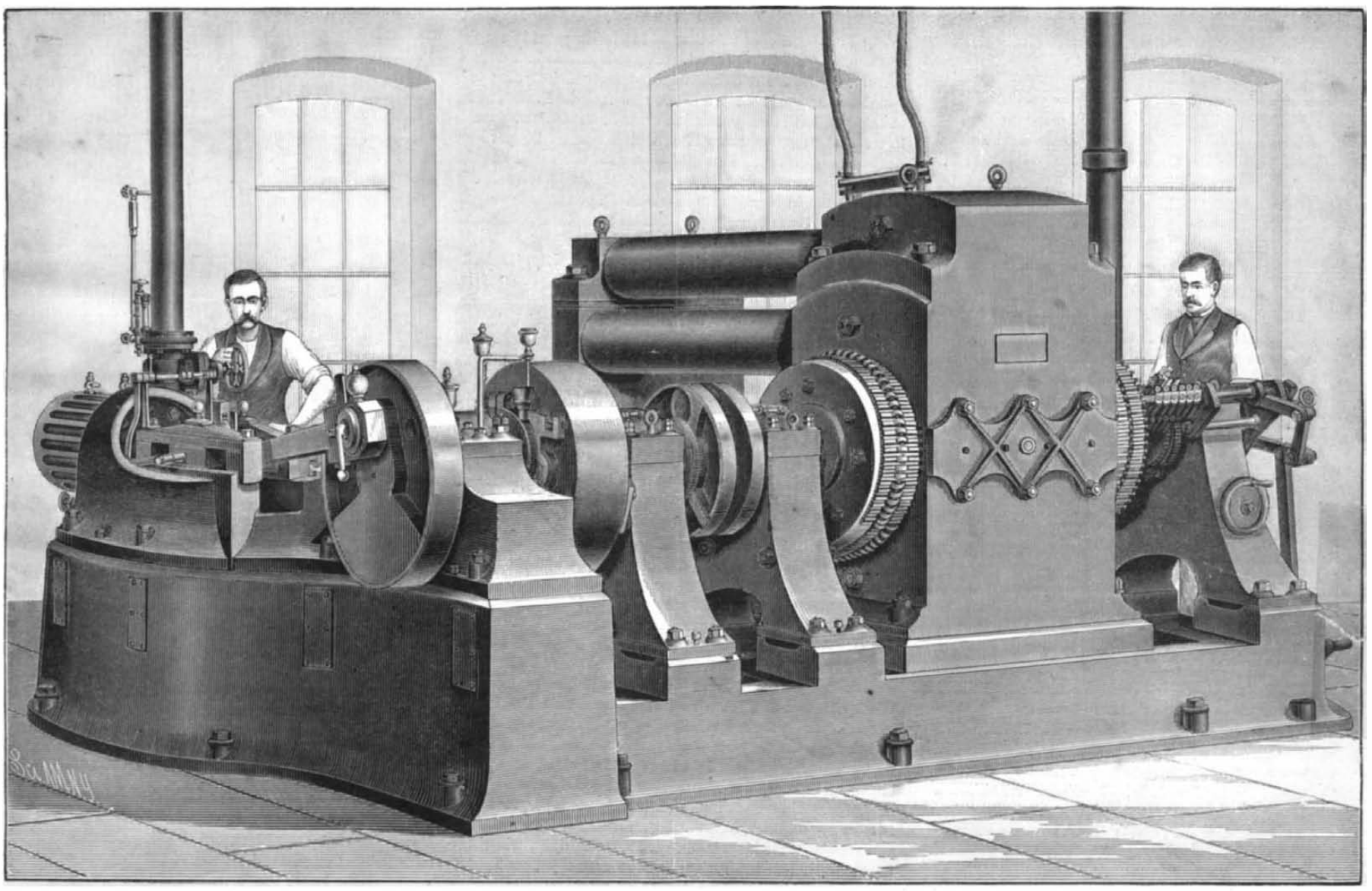
Fig. 2. Under such conditions as these, the resistance of the generator is small and permits of great subdivision of the current in multiple arc; there is no insulation to be burned, and it is possible in case of the deterioration of the bars to renew them easily, for they are simply screwed against their corresponding copper disks. In the new arrangement adopted by Mr. Edison, the field magnets lie horizontal, as shown in our engraving, instead of being placed in the vertical.

The central station now in process of construction will be provided with twelve steam engines of 150 horse power each, actuating dynamo electric machines, each of which will be capable of supplying 2,400 lamps of eight candle power. The current furnished to these lamps comes through the large sized conductors laid in the streets, from which smaller conductors lead into the houses. These conductors virtually bring the poles of the generator into each house, where the lamp wires can be brought in connection with them, thus rendering each house independent of any other, both for a supply of light and motive power.

An Acetate of Soda Stove.

An alleged improvement by a Dresden chemist, Herr Nieske, in the new method of heating with acetate of soda, consists in mixing hyposulphate of soda with the acetate. The former melts more quickly than the latter, and retards crystallization in cooling. Herr Nieske uses one volume of acetate with ten of hyposulphate. The cases are filled to the extent of three-fourths, hermetically closed, and kept in hot water till one no longer hears a sound from crystals within, on shaking. The cases will then give an equable heat from ten to fifteen hours, according to size. A room stove, acting on this principle, is described by Herr Nieske in the *Deutsche Ind. Zeitung*. It consists of an inner and an outer cylinder, the latter having numerous small holes. In the space between the two stand three of the heating cases. These can be easily lifted out by the handles, and put into water in the central cylinder, which can be heated in position by means of a burner below (or removed to be heated elsewhere). This done, the cases are lifted into their places in the annular space. The stove runs on casters and has a cover. The water in the inner cylinder furnishes, by evaporation, a wholesome degree of moisture.

DISCOVERY OF EXTENSIVE PINE FORESTS.—The recent exploration party of Colonel Mercer up the Spanish River, in the province of Ontario, is said to have discovered vast pine forests, containing upward of 24,000,000,000 feet of a superior quality of pine lumber, with facilities for getting it to market equal to the best.



EDISON'S STEAM DYNAMO-ELECTRIC MACHINE AT THE PARIS ELECTRICAL EXHIBITION.

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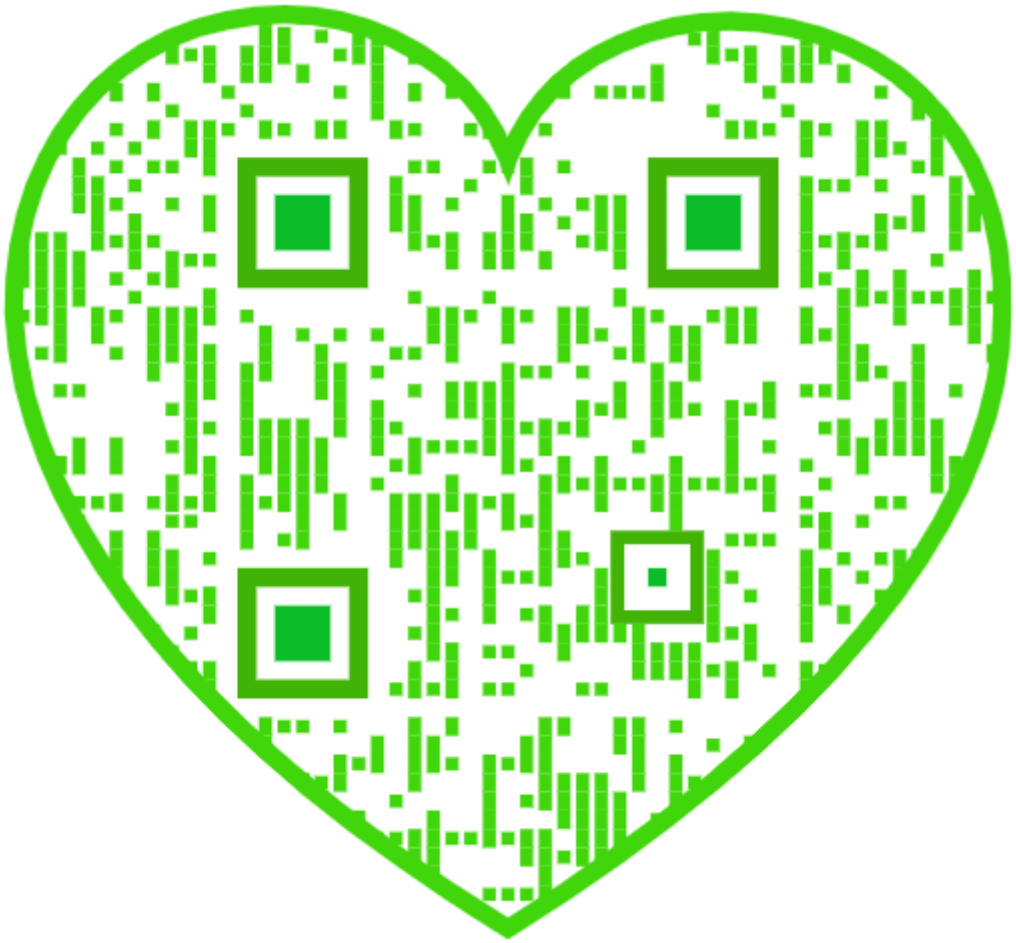

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CAN A PATENT BE SOLD BY SHERIFF FOR DEBT LIKE OTHER PROPERTY?

This question is frequently asked, and heretofore, in the absence of any definite decisions of the courts, we have been accustomed, for many years, to answer that an ordinary sheriff's sale of a patent would be invalid, while an assignment of the patent by the owner would hold good and carry title against such sheriff's sale. Further, we have held that the proper way for a creditor to obtain title to a debtor's patent is to procure an order from a competent court, compelling the debtor to sign a deed of conveyance.

This subject has lately received the attention of two separate courts, and we will here present the substance of both decisions.

The first case was in the Supreme Court of the District of Columbia, Murray *vs.* Ager, decided January, 1881. Murray, having recovered a judgment of $2,164 against Ager, who was the patentee of certain grain-dressing inventions, represented to the court that the only means he had to realize on his judgment was from the patent. Murray accordingly asked the court for an order compelling Ager to execute such assignments of patents to the purchaser as might be necessary to carry the title, in conformity with the patent laws.

The defendant admitted the judgment and ownership of the patents, but claimed that the latter were not subject to seizure and sale under the proceedings. The lower court took the same view and dismissed the bill; but on appeal the Supreme Court of the District reversed the decision of the lower court, and, in a very interesting and exhaustive decision, held substantially as follows:

"A court of equity may direct the sale of the interest of an inventor in his patent in order to satisfy a judgment obtained against him in a court of law, the writ of execution having been returned *nulla bona*, and for that purpose will require the patentee to make an assignment of the patent, as provided in Section 4,898 of the Revised Statutes of the United States, and in default of such assignment within a limited time, will appoint a trustee, with authority to execute the same."

The second case occurred in the Supreme Court of California, Pacific Bank *vs.* Robinson, decided April 19, 1881.

The court held that "a patent right issued under the laws of the United States may be required to be assigned to a receiver, under proceedings supplementary to execution, who may sell the same and apply the proceeds in satisfaction of judgment."

Thus, although an ordinary sheriff's sale of a debtor's patent right would be good for nothing, it appears from the foregoing cases that, when proper supplementary proceedings are taken, the courts may compel the debtor to make an assignment of his patent for the benefit of his creditors, or appoint a receiver for the patent, whose conveyance to the purchaser would be good.

LUMINOUS PAINT.

The introduction at this time of luminous paint is not the result of any recent discoveries or improvements in its manufacture, for we are told that the substance which Canton prepared was as good as any one can now make. Prof. Tuson, of London, has in his possession some of Canton's own make in a sealed tube, inscribed 1764, which retains its peculiar property to this day. It would seem as if the world was not yet ripe for the discovery, and it lay for more than a century a curious toy in chemical collections. Then all at once it springs into importance, both technically and for ornamental purposes.

In a lecture before the Berlin Polytechnic Society, Gaedicke gave some details of its history, which may prove of interest.

All the recipes for making the luminous material depend upon the formation of sulphur compounds, sulphides of barium, strontium, or calcium. They either set out with the sulphates, which are reduced in different ways, or with carbonates or oxides, that are treated with sulphur or its compounds.

The Bologonian phosphorus was made, according to John, from pulverized barytes, free from iron, by mixing it with gum tragacanth to a cake, drying this and heating it for an hour between layers of coal in a wind furnace. Osann reduced the sulphate of barium by igniting it in a current of hydrogen. In 1750 Markgraf heated sulphate of lime with charcoal—a method still in use to-day. Canton prepared a phosphorescent sulphur compound of lime, taking as his material burnt oyster shells, which he treated with flowers of sulphur. Grotthus attempted to improve on this method, and Osann modified it by substituting for the flowers of sulphur a metallic sulphide, which gave up sulphur when heated, such as sulphides of antimony, tin, or mercury. Wach returned to Canton's method, but mixed the flowers of sulphur with small quantities of metallic oxides, such as antimony, with the view of obtaining different colors in this way. The color of the light is generally white, or, at first, bluish. Hyposulphite of strontium, or equal parts of carbonate of strontium and sulphur, when ignited for twenty or twenty-five minutes, at first over an ordinary Bunsen burner and then over the blast lamp, give a green light, while carbonate of barium and carbon give an orange-yellow light.

The pure sulphides do not give any light at all. Hence the chemical composition alone does not condition its power of giving out light, since of two substances having the same composition, one may be luminous while the other is not. It seems rather as if the power of giving light depends not only on the correct chemical composition, but also upon a definite molecular condition. Hence it happens that the luminous substance obtained from burnt mother of-pearl is better than that from burnt oyster shells; also that when slaked lime is the material employed the result differs from that obtained from aragonite, although in all four cases the resulting substance has the same chemical composition. The luminous material is scarcely at all attacked by the common atmospheric influences.

The action of light upon such substances may be compared to striking a bell. A momentary impulse excites it and causes the bell to vibrate and give forth a tone, which tone lasts for a certain length of time, continually growing feebler, until finally it ceases entirely. So, too, the phosphorescent body. Excited by a momentary illumination it gives out a bright light at first, which grows weaker and weaker, until at last it can only be perceived by a perfectly quiet eye in the deepest darkness, and at last comes to rest. The after-illumination of these substances under discussion last much longer than the after-sound of a bell, since the waves of light are much finer than the metallic vibrations of a ringing bell.

Most sources of light will excite phosphorescence in these substances, *e. g.*, a petroleum lamp, gaslight, and even a match. In these cases, of course, the substance must be brought close to the source of light. It is excited especially by burning magnesium wire and by the electric light, but daylight is the best. Since water does not affect this substance, and since its luminosity is not due to oxidation, and hence does not need the presence of atmospheric air, it will give light under water.

An alcohol lamp flame colored yellow by common salt will not excite it, but if the alcohol flame is colored blue by copper it will. In the sun's rays those which lie in the violet and ultra-violet act the most energetic, and they decrease in power toward the yellow. It is remarkable how the yellow and red rays destroy the effect of the opposing violet rays by extinguishing or considerably weakening the luminosity caused by these latter. Similar relations prevail when the substance is covered with colored glass. Dark blue glass, although it seems to considerably weaken the light, permits all the active rays to pass through, and at times, when daylight contains many of the red and yellow rays, a substance that has been covered with blue glass is more strongly excited than if exposed to pure daylight, because the blue glass prevents the extinguishing action of the red and yellow rays. If a surface that has been covered with phosphorescent paint is first excited and then one half covered with pasteboard and the other with yellow glass, the extinguishing effect of the latter will be very noticeable. The portion covered with pasteboard will continue luminous after that which was covered with glass is almost total dark.

Heat has a peculiar effect upon the phosphorescent body after it has been isolated. It causes it to give a more intense light for a short time, but the luminosity is then of shorter duration than it otherwise would be. Heat acts here somewhat as it does on a magnet, driving out the active power, so that it requires to be charged over again to set the power again in action.

It seems as if light bears the same relation to the phosphorescence of these bodies that electricity does to magnetism; hence the name of light-magnet would not be inappropriate.

The color of the light thrown out is independent of the color of the exciting rays—*i. e.*, a certain substance always glows with the same colored light whether it has been excited by a violet, blue, or colorless light. Neither does the color depend on the addition of certain metals, but seems to be the result of a definite molecular condition of the substance. The light emitted retains its color but a short time. No matter how prepared they all get to be one color after awhile—that is, white (?).

The duration of luminosity is differently stated by different authors. According to Gaedicke's observation the best ones made at the present time last nineteen hours; but it requires perfect darkness and an eye entirely at rest, like on waking in the morning, to detect the faint glimmer. The intensity of the light, like the sound of the bell, is greatest at first and then decreases more rapidly than it does afterward.

Its luminosity is instantly destroyed by chlorine gas, also by hydrochloric and nitric acids; more slowly by sulphuric acid. It is further destroyed by substances which darken its color, hence it cannot be mixed with varnishes that contain lead and blacken; iron is also injurious because it rusts.

When used as a paint it is mixed with some adhesive substance like glue, and can then be mixed with oil, water, or a light-colored varnish, and applied repeatedly to the object that is to be rendered luminous. It is well to prepare a white ground for it with chalk or zinc-white mixed with a little copal, which may be dissolved in oil of turpentine.

P. N.

A Large Catch of Striped Bass.

A very extraordinary catch of striped bass was made November 18, by the Blackford Fishing Company, of Montauk Point, Long Island. Some 4,000 pounds of fish were captured, the larger proportion of the fish weighing from 50 to 75 pounds, while perhaps as many more escaped from the nets. The majority of the fish were females, their eggs not being matured.

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SMALLPOX.

There are few diseases that possess more interest, both for the physician and the public, than smallpox, and hence we take pleasure in laying before our readers a description of the treatment which has been used for many years with great success by Dr. Alban S. Payne, late Professor of Theory and Practice in the Southern Medical College, Atlanta, and Honorable Fellow of the Medical Society of Virginia, etc. The following is an abstract made by his permission from one of his lectures on smallpox.

Prof. Payne states that as early as 1846, when at the Smallpox Hospital in New York city, he noticed that the primary or initial fever of smallpox could be detected by the pulse before any other symptom appeared. This pathognomonic pulse is one peculiar to smallpox, a pulse *sui generis* difficult to describe, but recognizable by any physician who will patiently and carefully investigate the subject until his finger becomes educated. When once recognized it can *never* be forgotten, any more than a physician who has once learned to detect the hemorrhagic pulse could forget its peculiar thrill imparted to his educated finger.

Having learned to recognize the initial fever by its peculiar pulse, he next proceeds to vaccinate. If this is done within ten or twelve hours after inception of the initial fever the patient will have slight indisposition, without a *sign* of eruption, and as positive exemption from a recurrence of the disease as if he had had it in the most malignant form. The most remarkable feature about the whole thing is that if the patient is vaccinated early after the initial fever sets in, he may be then allowed to go where he pleases without fear of giving the disease to others. The ingrafting of the vaccine matter upon the primary variolous fever seems to have the power to destroy its ability of *reproduction* or propagation entirely. Another peculiarity is this: If an unprotected patient is vaccinated before the inception of the initial fever, and the vaccine takes, but does not prevent, only modifies the disease, the eruption will be varioloid in its appearance and characteristics. But if vaccinated after the commencement of the initial fever, and too late to entirely prevent an eruption, the eruption will resemble in size and other characteristics the smallpox eruption, it matters not whether there is one or a hundred pimples. There is as great a difference in the appearance of the varioloid eruption and the smallpox eruption as there is between gray and yellow.

Dr. Payne divides smallpox into confluent, semi-confluent, discrete, modified, and manipulated, the latter being a term of his own invention. In 1873 smallpox broke out in his neighborhood, in Virginia, and was of the variety known as *variola nigra*, and when not modified by some benign influence was invariably confluent. Those in and around Manassas were of the same variety. Being called to attend a colored chambermaid who had but recently aborted, and who was in a room over the kitchen of a large hotel near his own dwelling, he recognized in her the pulse peculiar to smallpox, and the next day the eruption appeared. In regard to isolation he says: "I saw it would never do to remove this woman, and I determined to *isolate* the case and abide the consequences, be they what they might. If I have her removed, I said, the poor woman must die, and the prevailing winds will blow the virus for miles down the valley below, and the disease will spread beyond control. But by isolating the case I have every confidence in my ability to check it. But should she die, she must be removed for burial (and that she will die there is a strong probability), and my plans will be defeated, and I shall incur the reproach of all my friends and neighbors. These were grave considerations, and I was by no means reclining on a bed of roses. Firm in faith of the greatest good to the greatest number, I never faltered. I said to myself, if she dies I will wrap her from her toes to the crown of her head in double linen, and with the aid of some one who has had the smallpox I will bury her." This was January 11, 1873. By the 30th she was convalescent, having had it in the semi-confluent form. Three persons who were in the room at the time were ordered to report to the doctor twice daily. One of them gave the peculiar pulse on the 24th and was then vaccinated. He was indisposed for two days, arm sore, but no pustules appeared. The others, who had been vaccinated before, did not take it.

Another case described by Dr. Payne occurred in January, 1873. He was called on the 24th to see W. J., suffering from an eruption which he recognized as varioloid. He vaccinated the father and two sisters, but an old aunt refused to be vaccinated, although she had not been vaccinated in many years, and she died on the 10th of February. The next day, January 25, he found the brother at home with the peculiar pulse. As he was unprotected Dr. Payne vaccinated him at once, and the very next day his arm looked as if vaccinated eight days before; it rapidly became sore; he was indisposed for two or three days, and recovered without a single sign of eruption.

In another case of an unusually poor and shiftless colored people, the whole family of eight persons, of all ages and both sexes, occupied a house that had only one room, in which the cooking, washing, and everything else had to be done. Good air and cleanliness were impossible. The father suffered from a very malignant case of varioloid and was terribly scarred up, but the rest of the family, none of whom had ever been vaccinated before, were vaccinated after the initial fever began, and escaped with slight attacks. One of the women had twenty pustules, but no scars; another had two or three pimples; a third had two on her face and one on the bottom of each foot; a fourth had no eruption. The boys had about twenty pustules each. We might quote numerous other cases of whites and blacks where vaccination after the initial fever had set in was followed by the arms becoming rapidly sore, malaise continued for a day or two, and rapid recovery with slight eruption or none at all.

On the 28th of January Prof. Payne's own family were exposed to smallpox, and the initial fever revealed itself in all their pulses on February 2. He revaccinated them; their arms became rapidly sore; there was very slight malaise for two days, and convalescence without any eruption.

Let us suppose a house located in the middle of a large prairie, and we see the grass burning at a distance, but the flames bending straight in the direction of the house. Would it not be the most sensible thing we could do to fight fire with fire, and, starting a counterfire, burn the grass around the house so that when the approaching flames reached the ground burned over the fire would have to stop for the want of combustible material and save the house? This is just what Dr. Payne proposes to do in treating smallpox. He recommends isolation, and giving the smallpox to all near by and likely to be exposed to its direful influences. Visit the parties twice a day, and as soon as the fever of inception is recognized vaccinate them, and the disease must stop for the want of material to feed upon. Hauling around to hospitals and pest houses is the best way to spread the disease.

Prof. Payne has tried his plan in more than a hundred cases, extending over a period of thirty-four years, without a failure. He now calls upon medical men to repeat his experiments and report on them.

STEAM BOILER NOTES.

It seems from a letter to the *Railroad Gazette* from London (England), date of October 1, that Glasgow locomotive builders almost invariably make their boilers with longitudinal butt-joints, having inside and outside covering plates quadruple riveted. For the transverse or circumferential seams the practice is about equally divided between butt-joints with outside covers only, with two rows of rivets, and the ordinary single riveted lap joint. The longitudinal joints are invariably placed above the water line. The one that joins the ends of the plate to which the dome is attached is generally put directly under the dome, and in some shops this is made a welded joint. The shell plates are thicker than those used by American builders, being from seven-sixteenths to nine-sixteenths of an inch thick. Rivet holes are sometimes drilled, other times enlarged from smaller punched holes by reaming, but neither of these methods is as common as one would infer from reading English engineering journals. Builders who drill the rivet holes do not complain of the extra cost of doing it, while those who are not prepared, suitable facilities being absent, to drill are inclined to exaggerate the cost of drilling or reaming over that of punching. In all these respects the writer of the letter referred to seems to approve of the English methods of locomotive construction.

It may be doubted whether with our superior American plates we may not make as good boilers by punching as the English can by drilling. Experiments showing that American punched plates have as much remaining strength as the same plates have with drilled rivet holes have been made, and in some exceptional cases punched bars have shown greater strength than drilled ones. Notable among such experiments are those made by Hoopes and Townsend, of Philadelphia, and published in the *Railroad Gazette* some time prior to 1880. It is claimed that soft tough iron will be somewhat compressed and strengthened just around the hole if proper tools are used to do the work, while hard, brittle, and granular iron will be injured by crumbling under the action of the punch; such plates are stronger when drilled; they are, however, unfit for boiler construction.

A question may also be raised as to the method of placing the dome upon a longitudinal seam. Much depends on the skill and faithfulness of the workmen in fitting the dome flange to the true cylindrical form of the shell, and it is probable that a riveted seam would tend to complicate the work and cause imperfections that would be less likely to occur in fitting the flange to a smooth and perfectly rolled portion of the plate at some distance from the seam. Therefore, unless it can be shown that the dome actually strengthens the seam, which is probably the notion that induces this practice, it will be an open question whether or not it is advisable to follow the plan.

With a perfectly smooth welded seam, which can be rolled into a perfect cylindrical form after being welded there can be no objection, provided always that the dome flange also coincides with the true cylinder of the same radius as the exterior of the shell. Slight variations even in the form of these parts when separate become important when riveted together; the dome flange, being imperfect and rigid, will distort the shell, and when acted upon by an internal pressure of 150 pounds to the square inch, tending to cause sections made on central planes cutting the envelope in any and all directions into true circles; in other words, to make the envelope a hollow globe, will place the parts in an unnecessary and exaggerated state of tension. The letter says:

"The method of supporting fire-box crown plates seems to be about equally divided between the system of direct staying with screw-stays, and cross bars or 'girder-stays,' as they are called here, slung to the outside shell or roof of the fire-box. Both methods are very unsatisfactory, and in a great measure unmechanical."

It will probably appear on carefully studying this subject that the thrust of the expanded furnace acting through rigid stays, which are not only slings but also struts, has a greater effect on the shell than the internal pressure itself; moreover, the thrust tends to distort while the pressure tends to restore the supposed true curve, and these antagonistic forces not being always evenly balanced cause motion, cross bending, and tensions concentrated in limited areas, resulting in grooving, which is simply an indication that the part grooved has become a hinge upon which the adjacent parts turn, exposing the disturbed structure of the metal to the chemical —meaning simply the corroding—effect of the steam or water, either of which, if they are moist and contain air or free oxygen, as they always do unless specially deaerated, will almost equally cause grooving of a bent or over-strained plate or brace inside of a steam boiler.

At a late meeting of the Common Council, the Detroit, Mich., inspector of steam boilers reported his total receipts for the month of October as $886.

About five hundred boilermakers of Detroit recently struck for an increase of twenty-seven cents additional pay per diem. The Union No. 3, of the United States, which includes the Detroit boilermakers, addressed a circular to their employers two or three months ago, and lately they sent a letter to every employer, notifying them that they would not accept anything less than the increase demanded. It is also understood that none of the manufacturers will reply to the document. It is a fact that with very few exceptions all the boilermakers in the city have already quit.

It appears from a late number of *L'Ingenieur-Conseil* that the Belgian Association for the Surveillance of Steam Boilers has made a report showing that they have two thousand boilers under inspection, and that during the existence of the association it has had but two accidents. A clause has been lately added to its rules to the effect that its responsibility will cease on notification of the discovery of a dangerous defect in any member's steam boiler till such time as the defect shall be repaired in accordance with its directions.

By the force of the explosion at the Alvarado Sugar Mill, Cal., on September 27, the second boiler was rendered useless; the roof of the boiler house was blown to pieces and scattered in every direction, and the main mill was ignited by the flames.

RESIGNATION OF THE COMMISSIONER OF PATENTS.

In the resignation of the Commissioner of Patents, Mr. Edgar M. Marble, the service loses an officer that can ill be spared.

Under his administration the business of the office has been conducted with commendable promptness and impartiality, and much has been done to increase the efficiency of the service and its value to inventors and patentees.

It is a pity that the government will not deal more liberally, not to say justly, with the Patent Office, and through it with inventors and the public at large. While the office is much more than self-sustaining, indeed is annually turning over a large sum to the treasury, it cannot for any length of time command, for it is not allowed to adequately pay for, the service of men who, like Mr. Marble, have exhibited unusual executive ability.

As a consequence the office now loses a chief whose temper and capacity and exceptional knowledge of patent law, not less than his hearty sympathy with the spirit and purpose of the patent system, have proved him to be the proper man for the place.

It is not easy to find men so well fitted for the severe, complicated, and, at the same time, delicate duties of the Commissionership of Patents. For such service, more especially in an office with large surplus revenue, the government ought to be willing to pay as liberally as business corporations can, and give as ample a guarantee of permanence in the employment. We understand that Mr. Marble has accepted more lucrative employment as Land Commissioner for the Northern Pacific Railroad Company.

Steamboat Inspection

The annual report of the Supervising Inspector-General shows that the tax collected from licensed officers of steam vessels amounts to about $7.50 *per capita*, which appears to be largely in excess of the needs of the inspection bureau. This year alone the surplus is nearly $89,000, while the accumulated surplus now lying idle in the Treasury amounts to a total of about $650,000, which Gen. Dumont thinks would suffice for the expenses of his department for a term of fifteen years, if the tax should be reduced about 50 cents for each license per annum. He therefore recommends that Section 4,458 of the Revised Statutes be so amended as to require from each master, engineer, pilot, and mate, the sum of 50 cents for every certificate granted.

His report shows that during the five years ending with 1881, 22,132 steamers were inspected, 932,500,000 passengers were carried, and that 1,053 lives were lost by steamboat disasters, which is an improvement over the preceding five years, when less work was done at a greater cost, and a less number of passengers were carried with a greater loss of life from disasters.

Ball Holes in Glass.

Reviewing the evidence in the second trial of Jesse Billings, Jr., Dr. Lewis Balch, of Albany, N. Y., sets it down as established that a ball fired through glass may make a hole enough smaller than the full size of the ball before firing to prevent an unfired ball of like caliber passing. In an experiment with a baseball it was found that the hole made was too small by one-third to let the ball be passed through.

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THE MUSCULAR POWER OF INSECTS.

The muscular system of insects is in no wise inferior in power to that of vertebrate animals, and it may even be asserted that it is capable of developing an infinitely greater amount of force. Observation has demonstrated this most fully. Who has not seen the ant dragging along prey ten or twenty times larger than itself? Who has not watched the motions of certain small flies as they unwearyingly poised for hours around the chandeliers and other objects in our houses? And who has not ascertained that the horse-fly follows and beats the best horses running at full speed?

In order to render the fact more striking, M. Felix Plateau has undertaken an ingenious series of experiments of the most demonstrative character. He has caused small wagons filled with weights to be drawn by cockchafers harnessed to them in the manner of oxen; he has loaded swift-flying insects with weights; and he has thus, in the first place, ascertained this great fact, and that is, that muscular power is in inverse ratio to size—the smallest insects being capable of displaying the greatest effective force. Then he established the fact that a cockchafer is infinitely stronger than a horse, that it is even twenty-one times stronger, and that a bee is even thirty times more vigorous. The fact is that a horse cannot exert a stress beyond the sixty-seventh of his weight, while a cockchafer can easily draw a load equal to fourteen times its weight, and a bee, harnessed to a little wagon twenty times heavier than itself, can put the same in motion without any trouble. In other words, a cockchafer is capable of drawing with ease fourteen, and a bee twenty of its like. Can any one conceive of the wonders that man would accomplish were he so fortunately endowed, and had he at his services domestic animals possessing the muscular power of the insect? We stand in astonishment before the gigantic monuments of antiquity, but how much more gigantic would be the structures that man would erect had he at his service the power possessed by the most insignificant fly! Fig. 1 will give an accurate idea of the apparatus employed by M. Plateau to measure the amount of traction that insects are capable of exerting. Insects, being obliged to expend much power in order to sustain their flight, are not capable of lifting a very great weight, and they can scarcely carry prey that is heavier than themselves. Such is the case with the dragon-fly, represented in the engraving loaded with a ball of wax.

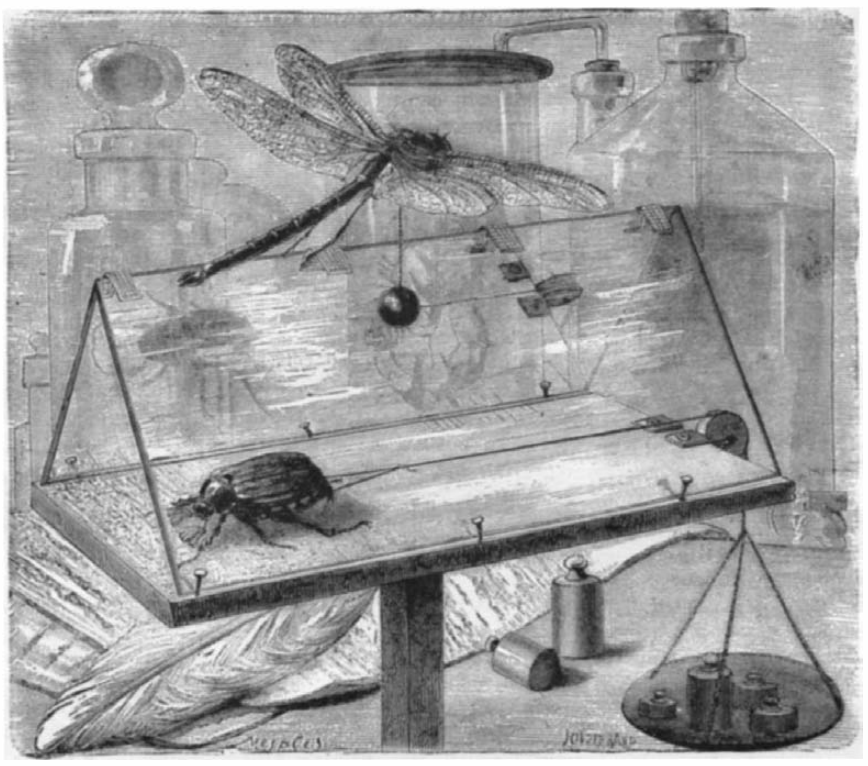

Fig. 1.—APPARATUS FOR MEASURING THE MUSCULAR POWER OF INSECTS.

Insects may be separated into two great divisions: (1) Those which have alar muscles inserted directly into the wings, and which have an independent system of muscles for each of these organs (the majority of *Neuroptera*, for example, in which each pair of wings may co-operate in flight without the intervention of the other pair), so that the removal of one of the pairs of wings does not carry with it the loss of power of flight. (2) Those which have only one system of muscles operating either one pair of wings or the two pairs. In the first case a single pair of wings is used in flight (*Coleoptera, Orthoptera*); in the second, the two pairs, connected with one another, are moved as one (*Lepidoptera, Hemiptera, Diptera*). It is essential to remark that wings do not perform the same rôle in all insects, and that they have neither the same dimensions nor the same structure in all groups. M. De Lucy has demonstrated that the surface of the wing decreases in proportion as the weight and dimensions of the animal increase; thus, for example, the gnat, which weighs four hundred and sixty times less than the stag-beetle, has fourteen times more surface than the latter, and the lady-bug, which weighs one hundred and fifty times less than the stag-beetle, has five times more surface. And we have daily before our eyes other examples of this same fact in butterflies (*Limenitis, Morpho*), with their delicate bodies and immense wings, and gad-flies, with their heavy, thick-set bodies and narrow wings. It may be readily conceived from this that there is no fixed relation between this surface and that of the animal to be lifted; but there is, as Pettigrew has observed, an invariable relation between the weight of the animal, the surface of the wings, and the number of oscillations that these make in a given time, "the problem of flight resolving itself into another one of weight, of power, of velocity, and of small surface, or, indeed, into a second one of feeble density, middling power, small velocity, and great surfaces —weight being an indispensable condition." Thus, the number of beats or oscillations of the wing being, in a common fly, 330 per second, and in a bee 190, they are, in a dragon-fly, no more than 28, and in the cabbage butterfly only 9 (M. Marey).

It is generally believed that, in all insects in general, the nerves form an aeriferous, tracheal network which is thought to play an important rôle. But this is not so. In *Lepidoptera, Neuroptera,* and *Hymenoptera,* all the nerves contain a trachea, but in *Coleoptera* and *Diptera* there is only one tracheal branch, this being in the costal nerve; the development of the tracheal network and of the nerves is correlated with the dimensions of the wings.

Many authors have tried to make out that the elytra co-operate in flight, and have asserted that these often act as parachutes during descent; but observation does not justify their opinion. The *Cetonia* (4), whose wings remain joined during flight, seemed an embarrassing exception, but M. Poujade, a young naturalist, has published some excellent figures representing a series of insects in the attitude of flight, and an examination of these shows us that many of the insects put their elytra in such a position that the latter cannot possibly obtain any purchase on the air. The *Necrophori* (8 and 9) and the *Silphæ* (2) straighten their wings, invert them, and arrange them on the abdomen in a horizontal plane; the *Onthophagi* (5 and 6) raise them simply, and cause them to turn about the suture as if on a hinge; and the *Histri* (7) place their elytra perpendicular and horizontal to the axis of the body, but, extended, they hardly exceed the auxiliary pieces of the lower wing. Nos. 2 to 9 are instructive in more senses than one, for they show us the very peculiar position of the median legs, raised above the body, while indicating to us the position of the anterior edge of the wing during flight, thus allowing us to understand that it really operates like a kite. Thus we see a new confirmation of the explanation that we have given of the mechanism of flight.

2. 3. 4. 5 and 6. 7. 8. 9.

Fig. 2.—THE FLIGHT OF INSECTS.

The alar surface is, by all means, infinitely too great, and it may be largely reduced without detriment. This fact has been most fully demonstrated by the experiments of MM. Girard, Pettigrew, and Jousset de Bellesme. At least a third part of the four wings of dragon-flies and a third part of the two wings of common flies may be removed perpendicularly to the anterior edge without modifying the flight of these insects; and the hind wings of some butterflies and *Hymenoptera* may even be removed completely without preventing aerial locomotion.

I will add to this subject an experiment of my own.

Having caused all the humble-bees met with on a trip to the Botanical School of the Garden of Plants to be captured and brought to my study, I anæsthetized each in turn, and sure of operating on them without lesion, I as delicately as possible cut off their lower wings. The window was wide open and the weather was fine; and as each amputated individual came to, he took his outward flight, apparently not the least bit affected by the loss of two of his members. The next day I captured my invalids on the flowers around the school, at some hundreds of feet from the place of operation.

In the *Diptera*, however, the loss of the small rudimentary organs called the "halters" or "poisers," which take the place of the inferior wings, destroys the power of flying upward. Physiologists and naturalists have ascertained this fact, but without being able to give a reason for it that is entirely satisfactory. Dr. Jousset de Bellesme, as a result of some interesting experiments in 1878, was led to believe that the function of these halters was to restrict the course of the wing backward, to thus carry the axis of sustentation forward of the center of gravity, and thereby provide for upward flight.

From all such experiments as permit of measuring the effective surface of the wing there is derived one fact of capital importance, and that is, that the membranous posterior portion of the wing may be clipped and trimmed and mutilated with impunity, but that the anterior stiff edge must not be removed nor even wounded, for the costal and subcostal nerves perform precisely the same rôle as the cross stick in a kite—and what child is there who does not know that the removal or even the breaking of that stick will prevent his plaything from rising in the air?—*J. Künckel, in La Nature.*

Another Giant Squid.

After a severe northwesterly storm at St. John, Newfoundland, accompanied by the highest tide observed there for many years, a giant squid came ashore near the steamer wharf, Portugal Cove, Nov. 12. It was captured by fishermen, and is the first fresh and unmutilated specimen ever secured. It measures thirty three feet from the tail to the extremities of the long tentacles.

The Corwin's Collections.

The collection of specimens and relics brought back from Arctic regions by the Arctic cruiser Corwin is described as large and interesting. Lieutenants Myrick and Doty have accumulated a rare assortment of models of weapons and boats used by the tribes inhabiting the extreme northern limits of the habitable portion of the globe. These models include boats of various shapes and character, hunting weapons, pipes, bird traps, nets, and other trinkets which would prove invaluable to a collector of the curios in any portion of the world. Dr. Ross, of Washington, who accompanied the expedition, has a collection of very rare specimens from the Alaskan and Siberian coasts, as well as from Herald Island and Wrangell Land. Among these are specimens of the flora, vegetation, soil, and minerals of the newly acquired territory, New Columbia. Among the flora may be seen some of the most delicate and beautiful flowers, and while all are void of brilliant colors, the leaves and blossoms, all of delicate tints, are very beautiful and extraordinarily curious as coming from an unexplored land so close to the North Pole. The grasses are also delicate, and resemble both the common bunch and "foxtail" variety of California and the blue grass of the Eastern States. The rock from Wrangell Land is a coarse blue sandstone, a fine slate, and some pale drab sandstone, all good building material. The specimens of coal from Cape Lisburne, on the north coast of Alaska, are of a deep black color, soft and bituminous. It is easily ignited, and emits a strong sulphuric odor. From Herald Island the Corwin brings some fine specimens of granite, which is susceptible of a high polish. It is gray in color, and resembles the granite of Lake Superior and the coast of Maine. Among the curiosities in the possession of Mr. Haloran, the boatswain of the Corwin, is the tooth of a mammoth found upon the shores of Siberia. It is as large as a 20-pound cannon ball, and being petrified, is equally as heavy. The collection of curios brought down from the Arctic by the Corwin is, perhaps, the most interesting of any brought to San Francisco.

THE ELECTRIC LIGHT IN BARCELONA.—We learn from Don Francisco Tarre, of Barcelona, Spain, that the electric light is now being successfully introduced in that city by the Spanish Electrical Society. The Gramme machines are used.

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Another 8,000 Ton Steamer.

We recently gave an account of the coming over here of the new steamer City of Rome, and now we have to record the arrival of another great vessel of the same class, the Alaska, of the Guion line, between New York and Liverpool. On this her first passage, as a matter of precaution, steam was only carried at 65 lb., though she is fitted to carry 100 lb. Her best run was 402 miles in a day; but it is believed she will, before long, make 440 miles.

The Alaska is an admirably proportioned vessel. Her gross tonnage is 8,000; tubular length, 526 feet; breadth, 50 feet 6 inches; depth, 40 feet 7 inches to upper deck, 48 feet 7 inches to promenade deck. Her engines are of the compound, inverted, direct acting, cylinder type, the high pressure cylinder being 68 inches in diameter, and the two ton pressure cylinders 100 inches diameter each. The indicated horse power is 11,000, the highest on any steamer in the world. She is built with five decks, the first being the promenade, which runs the full length of the deck, excepting for short breaks aft and forward. For the accommodation of cabin passengers her fittings are most complete, the large saloon being the entire breadth of the vessel and situated amidships. Tables and revolving chairs are provided for 280 passengers, and the upholstery and other furnishings are handsome. Besides the large air ports along the sides of the saloon, there is a stained glass dome overhead, thus furnishing ample light and ventilation at all times. The staterooms are ranged on either side of long passageways, forward and aft of the saloon, each connected with the steward's department by electric bells and furnished with electric lights. The smoking room, ladies' boudoir, social hall, and card rooms are elaborately fitted up. The second cabin is aft, and much attention has been paid to the comfort of second class passengers. The steerage is well and conveniently arranged. The officers' quarters are on the main deck. The vessel is steered by steam, and has steam windlasses and winches for weighing anchors and handling cargo.

She has four masts, the two forward ones being square rigged, and the others schooner rigged. She is built of iron in a series of water-tight compartments, and is provided with the most modern methods for insuring safety and comfort at sea.

Large Photograph.

A photograph, probably the largest ever printed upon a single sheet of paper, is now on exhibition in the art gallery of the American Institute. It is not uncommon to see several views which have been separately printed on small sheets of paper and pasted together to make a panorama of large industrial works, etc., but this remarkable specimen was printed from seven negatives on one sheet of paper, and covers an area of over ten feet in length by about eighteen inches in height. It is a panoramic view of the Centennial grounds in Philadelphia, Pa., and so perfectly are the negatives joined that it is impossible to locate the joints. Were it not for the announcement of the exhibitor that it was printed from seven negatives, no lay observer would imagine that it was other than a single view printed from a single negative.

Duplicates of this picture have been sold at very high prices as sample works of photo art. One was presented to Queen Victoria, and is said to occupy a conspicuous place in the royal gallery. This work is from the gallery of F. Gutekunst, No. 712 Arch Street, Philadelphia.

His exhibit includes other fine specimens. A notable one is a picture five feet long by eighteen inches high, also on a single sheet; and some large views in printer's ink which combine the effect of fine steel engraving with exactness of detail that can only be obtained by the use of the camera. This latter style is especially desirable for views of engineering structures and machinery, which enables the observer to study construction with confidence.

Antidote to the Poison of Serpents.

Very interesting experiments have been made in Brazil, by M. De Lacerda, which have established the fact that permanganate of potash is one of the most energetic antidotes to the venom of snakes. M. De Lacerda has addressed a memorial of his important works to the Academy of Sciences (meeting of the 12th of September, 1881).

The result of these researches is really astonishing: thus, in a series of experiments, frequently renewed, of injecting the active venom of *boshrops*, diluted with distilled water, in the cellular tissues or the veins of dogs, M. De Lacerda found that the permanganate of potash was able *to stop completely the manifestation of local injuries from the venom.* Yet the same poison, which had served for these experiments, being injected without antidote into other dogs, always produced great local tumefactions, with loss of substance and destruction of tissue.

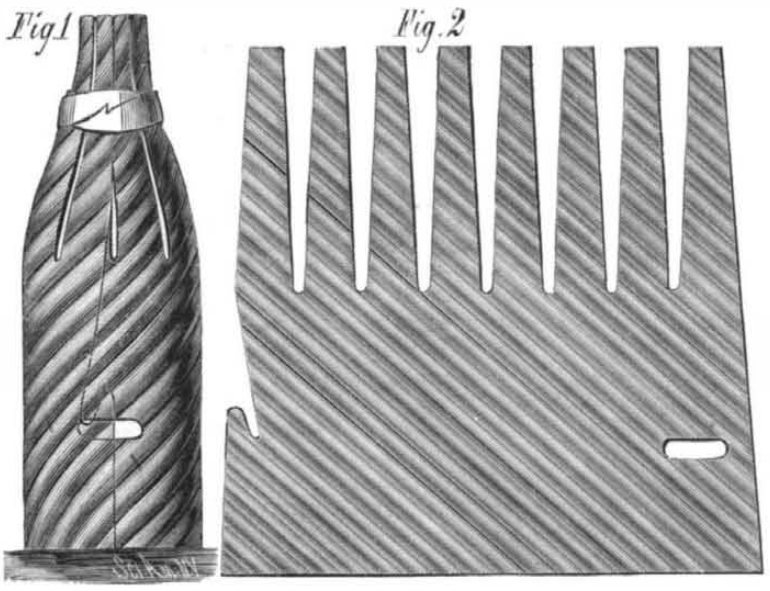
These very remarkable results have been stated on various occasions, not only by the Emperor of Brazil, who assisted at these experiments, but also by physicians, professors of faculties, and members of the diplomatic corps.

NOVEL BOTTLE WRAPPER.

The engraving shows an improved protective bottle wrapper lately patented by Messrs. H. J. Mark and W. F. Martinek, of St. Louis, Mo.

The body of the wrapper is made of veneer or pasteboard, having attached to it thick paper corrugated diagonally. At one edge of the wrapper there is a locking tongue, and near the opposite edge there is a slot for receiving the tongue.

The upper edge of the wrapper is slit to form a series of elastic fingers, which are drawn together about the neck by means of a paper band or tie. Fig. 1 shows the wrapper in its flat state; and Fig. 2 shows the manner of applying it to the bottle.



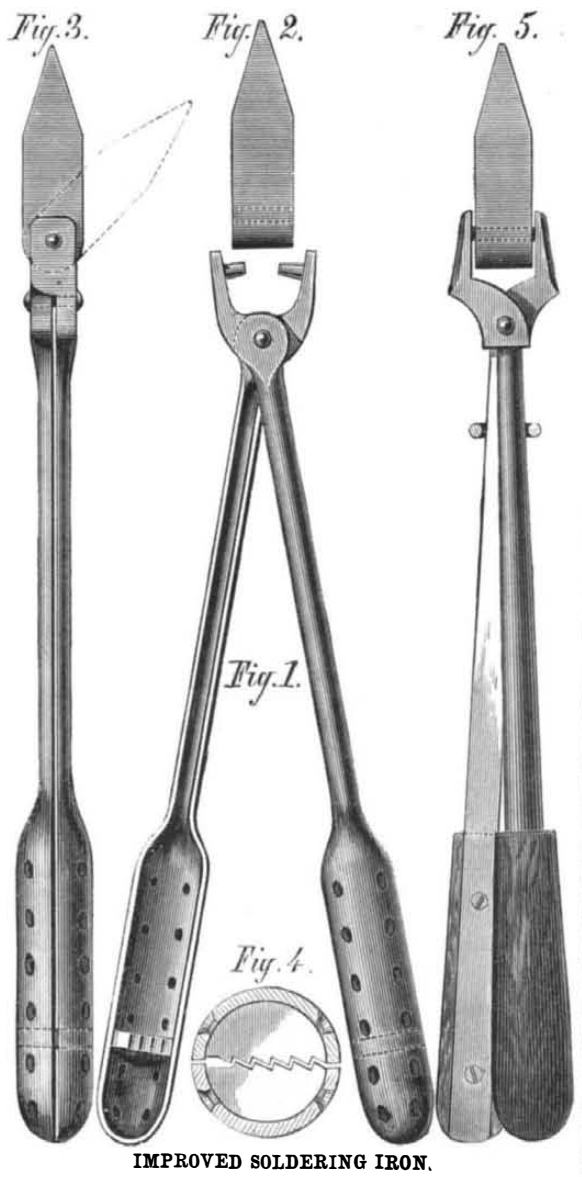
NEW BOTTLE WRAPPER.

IMPROVED SOLDERING IRON.

The engraving shows a convenient means of adjusting the coppers of soldering irons on their handles, and also for keeping the handles cool.

Fig. 1 is a side view, with handles in an open position. Fig. 2 is a side view of the copper. Fig. 3 is a side view, showing the handles closed and the copper attached. Fig. 4 is a cross section on line *x x* of Fig. 1, and Fig. 5 shows a modified form for wooden handles.

The two portions of the handles are pivoted together to form the jaws, each having a pin or lug on its inner face. The copper is of suitable form, having a cross aperture, into which the pins of the jaws enter when the handle is closed.



IMPROVED SOLDERING IRON.

The shanks of the handle are formed of malleable iron, and their outer ends are enlarged to form a hollow handle. This portion has numerous perforations, which allow circulation of air to keep the handle cool.

On the inner side of the handle are ratchets for engagement when the two parts are closed, to prevent them from slipping apart. With this construction the handles can be removed from the copper while it is being heated, and heating of the handle prevented. The copper may be turned at the desired angle before being clamped tightly by the jaws, and the angle may be readily changed while the tool is in use.

In using wooden handles in place of the hollow bulbs, the inventors provide a ring on the shank, as shown in Fig. 5, which, when slid outward, holds the jaws closed.

This invention was lately patented by James and Thomas H. Hughes, of Spencer, Mass.

MISCELLANEOUS INVENTIONS.

Manufacturers of paper-hangings will find it to their interest to examine the paper-hanging machine and rack recently patented by Mr. Henry Staib, of New York city. In the manufacture of paper-hangings the web of paper as it comes from the printing machine is carried to a rack, where it is suspended to dry in loops on sticks placed at intervals. This invention principally relates to mechanism for taking the paper and carrying it upon the racks, and to the racks used for supporting the paper, whereby the work is facilitated and the operation rendered automatic. In this mechanism rocking arms, which receive their motion from a rotating shaft, first move downward, and, striking a projection on a belt, which has its return movement controlled by a weight, cause said belt to carry the lower stick of a pile of sticks out upon the rocking arms, which are notched to receive the stick. These arms then move upward and deposit the stick, having the paper over it, on rack-bars above in front of pawls attached to slide-bars. A loop of paper is thus carried to and remains suspended from the rack, while the rocking arms move back to receive another stick and loop. The slide-bars then move forward and the pawls carry the stick and loop of paper, after which said bars move back to receive the next stick brought up by the rocking arms, and at the next forward movement both sticks are carried forward. This operation is continued to any desired extent. There is also combined with the slide-bars a roller for automatically marking the web to insure uniformity of the rolls into which the paper is finally made, and a counter for registering the number of loops of paper.

Mr. William T. Lyons, of Decherd, Tenn., has patented an improvement in ice machines which is deserving of notice. The invention consists in a refrigerating apparatus composed of an air-exhausting pump and an air-supply pump separately connected with a series of pipes in a refrigerating chamber for obtaining circulation of air through said pipes by the operation of the pumps, the exhausting one of which is of greater capacity than that which supplies air to the pipes, whereby the air is rarefied, and the atmospheric air drawn in by the smaller pump, in passing through the rarefied air, absorbs more or less heat and reduces the temperature in the refrigerating chamber to the extent required.

An improved life preserver, which appears both simple and practicable, has been patented by Mr. Rosendo Torras, of Brunswick, Ga. This device mainly consists of two parallel cylinders made of any suitable, flexible, waterproof material, supported internally by longitudinally arranged helical springs, and connected externally by gyves, the rings of which encircle the cylinders, and which gyves may be laced with tie ropes. This construction admits of the cylinders being compressed in direction of their length and retained in a small compass, and, when distended, of their forming a pontoon for buoying shipwrecked persons. The extensible cylinders are fitted with flexible receptacles for food and water arranged within the springs and accessible from the exterior by necks projecting through the gyves. There is also combined, with the device, an oar for steering or propelling the raft, and which is constructed so that it may be used to lock the cylinders both in their distended and closed conditions.

An automatic hog-feeder, the object of which is to facilitate the feeding of hogs and prevent waste of the food, has been patented by Mr. Hiram T. Phenix, of Oketo, Kan. This device is formed in part of a box of any desired length and depth, according to the number of hogs to be fed and the quantity of food to be given at a time, and of such a width that two hogs may feed from opposite sides without their heads coming in contact. Said box, which has openings in its opposite sides of a size sufficient for a hog to insert its head only, is divided by longitudinal and transverse partitions into food chambers and feeding compartments having inclined covers and regulating slides, whereby the food is only supplied as it is eaten and the escape of food from the food compartments can be shut off when desired. By means of this feeder the hogs cannot waste the food, and cannot get their feet into it and dirty it.

A very simple and useful fastening for pocket book handles, which provides for the handle being shut up within the pocket book when not required for use, has been patented by Mr. Thomas P. Spencer, of New York city. The invention consists in the combination with the pocket book frame having slots and bars across the slots, of hinged straps connected with the handle, whereby the said handle can be swung down into and inclosed within the said pocket book, the cross bars of the slots forming the hinge pivots of the straps to which the handle is attached.

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The Infection of American Cattle on English Ships.

A very instructive report has been submitted to the Department of Agriculture by Dr. Charles P. Lyman, veterinary surgeon, who was sent by the department to England last summer, to investigate the origin of the foot and mouth disease which had appeared in certain shipments of American cattle. The course of the cattle on this side had been carefully traced, and no signs of the disease had been detected along the roads or in the stockyards the cattle had passed over and through.

It appeared certain, therefore, that the disease was caused by infection, communicated to the cattle after they were shipped from American ports. After very careful inquiries, Dr. Lyman discovered that the vessels, portions of whose cargoes of cattle were condemned, had brought to the United States on their outward voyages general cargoes, among which, in many cases, were such articles as "bales of goat skins," "casks of salted skins," "bales of unwashed Australian wool," "bales of Russian wool," "bales of raw skins," "casks of wet skins," "bundles of grain bags," and "bundles of head ropes." In many cases these articles were carried in those portions of the vessel which were occupied by cattle during the return voyage. Dr. Lyman found, however, that upon some of the vessels upon which the disease was found to prevail upon their arrival in England, no such articles had been carried on the outward voyage. The fact that hides, skins, and wool had been carried was not, therefore, sufficient to explain the subsequent outbreak of the foot and mouth disease on apparently uninfected vessels.

Cattle shipped to Great Britain, whether from the United States or from the continent of Europe, are tied to stanchions by ropes passed around their horns, these ropes being technically known as "head ropes." Dr. Lyman found, after careful investigation, that it is a common practice to drive the animals ashore with these "head ropes" still attached to their horns. Sometimes these ropes are detached before the cattle leave the stockyards, but frequently they go with the animal to the butcher. Dr. Lyman also discovered that these "head ropes," gathered from cattle received from France and Germany, as well as from the United States, are often shipped to the United States to be used in tying other animals shipped to Europe.

Following up this clew, Dr. Lyman became convinced that in most cases the infection had been conveyed by the indiscriminate use of head ropes impregnated with the virus of the disease. It was by means of such head ropes, according to Professor Brown, of the British Veterinary Department, that the disease had been introduced into the London yards from France, in September, 1880, and subsequently conveyed to the Liverpool stockyards.

Dr. Lyman proposed, as a preventive of future outbreaks among American cattle in transit, that the department ask Congress to pass a law prohibiting the introduction of all articles from the foreign animal wharves of Great Britain. One would naturally think that the hazard attending the use of old head ropes would be sufficient, now that it is known, to deter our enterprising cattle shippers from using them.

Touching the condition of American cattle on their arrival in England, Dr. Lyman says, that notwithstanding the much greater distance they are necessarily carried, they arrive with fewer bruises and in better condition generally than do those from some of the neighboring European ports. This gratifying condition of affairs is due to the good care and improved methods of ventilation, etc., adopted by the owners of steamships. The losses of cattle on shipboard from January 1, 1880, to September 30, 1880, exceeded five per cent; in the corresponding months of 1881 the losses were about two and one-half per cent.

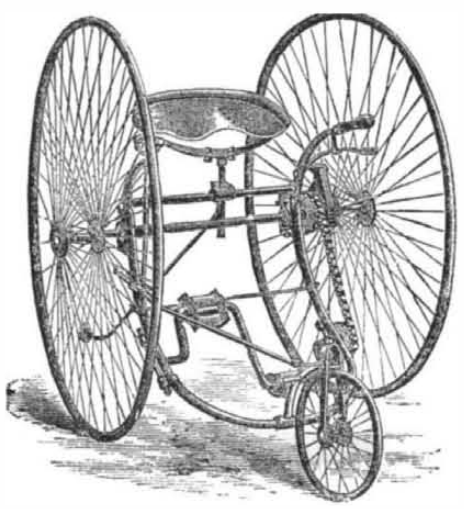
Torpedo versus Fire.

Torpedoes had been up to a very recent date considered in the exclusive light of their destructive properties—it is gratifying to see that they can also be put to the use of preserving property from fire. On the 10th of August, one of the magnificent steamers belonging to the French Transatlantic Company was at Goletta, discharging. Her name is a well known one, as it reminds us of one of the founders of that company; it was the Isaac Pereire. So late as one o'clock in the morning the work of discharging had been going on under the superintendence of Captain Araud, the commander; he then went a last time round the ship, and retired to rest. At two o'clock he was roused by an alarm from the fore part of the ship. The Isaac Pereire was on fire, and the fire had spread with such a rapidity that the crew had to leave their quarters without saving anything. The steerage passengers, surrounded as they were by the raging element, were saved only owing to the unremitting exertions of the crew and the skillful maneuvering of the commander, who swung his ship, and, placing her before the wind, thus limited the advance of the fire and kept the stern untouched. Meanwhile the purser and doctor were busy protecting the saloon by closing the bulkheads and disposing the hose. The sound of the bell had called the assistance of the men-of-war at anchor in the harbor, and soon twenty-two steam launches and other boats had come to the rescue. Commander Araud wanted to scuttle the forepart of the ship, but the heat was so intense that the men who attempted it, although protected by a continuous and powerful stream of water thrown upon them, had to fall back, not without having been severely scorched. Commander Araud then applied to the officers from the men-of-war for a torpedo, but they at first declined to take such a responsibility upon themselves, a responsibility which the commander did not hesitate to assume. A torpedo was procured, and everybody taken away from the ship, with the exception of Commander Araud, who stood on the bridge. A first torpedo missed fire, a second sent the Isaac Pereire down stem foremost. Her commander, who had not left the bridge, was safely rescued from the water, having only by a miracle escaped being hurt by the explosion. The Isaac Pereire will be easily raised.—*London Review.*

Double-Driving Tricycle.

Considerable activity has of late sprung up in the manufacture of tricycles, which are considered as safer vehicles than the bicycles, especially for those who are not gifted with the natural skill necessary for working the latter. We here give a cut of a new English tricycle by Hillman.

The driving wheels, 50 inches in diameter, run in double ball bearings, affixed to the back of the frame, which is composed of seven-eighths inch steel tubing. A single length of tube bends in hook form at the top above the bearings, being strengthened close to the bearings by a transverse tube, carrying the seat socket. The loop formed by the main portion of the tubing sinks in a hollow curve forward, the sides running parallel and uniting in a bowed front, from the center of which the backbone of the rudder wheel departs. This rudder wheel is 17 inches in diameter, runs in ball bearings, and works in a fork head, with gaping slot, to allow of greater facility in turning. The hook-like ends of the upper part of the frame are used for affixing the handles to an ordinary pear-shaped, purchase handle finding a place on the left-hand side, while the right-hand end of the frame finishes in a socket, in which an upright rod works,



bearing a spade handle at its upper end and a pinion wheel at its base, which, working in a ratchet in connection with the rudder wheel, forms the guiding communication. The pedal shaft is double-cranked, provided with rubber pedals, and works at each end in parallel bearings. The safety of the rider is secured by light rods proceeding backward, and carrying a small safety-wheel at their junction. The spring is placed at right angles to the machine when a seat is supplied, and in a line with the running when a saddle is preferred; it is adjustable to height of rider, and places him well over his work.

The chief feature of the machine, however, is the double driving action. It consists of a stout toothed wheel and box, all in one piece, the outside of this box forming a fine broad surface for the strap brake to work upon. On the inside of the box there are two toothed wheels and two pinion wheels; the former are placed about an inch apart; they are the same size, and are each connected with one of the driving wheels. The pinion wheels are fixed upon studs projecting from the side of the case, and are so arranged that, while each pinion gears with a different toothed wheel, they gear with each other in the space between the main wheels, one pinion projecting forward, the other backward, for the purpose. This arrangement causes both wheels to be driven when running straight, at the same time allowing the outer wheel to travel faster as requisite for turning purposes, and when driving ahead an equal amount of power is imparted to each wheel.

A New Application of the Radiometer.

A new application of the radiometer to photometrical purposes, suggested by M. Coulon, is described in *La Lumière Electrique*. The instrument is really a photometrical balance, and is simple in principle, although some rather complicated arrangements are required to prevent disturbance from surrounding influences. It is generally known that the movement of Crookes' radiometer is now ascribed to the action of radiant heat, although at the time of its discovery the motive power was thought to be light. M. Coulon, however, claims to have proved by experiment that a radiometer of which the temperature is constant, revolves solely under the influence of light. Whether this contention is well founded or not remains to be proved by independent observation. Upon this principle the Coulon photometer is based, and the name *athermanous* which it bears is a further evidence of the importance attached to this rehabilitation of Crookes' supposed discovery of the motive power of light. The apparatus consists of a radiometer bulb, fixed in the middle of a cube-shaped metallic box, having four glazed apertures in its sides. Horizontal rays of light from two opposite sources can enter by two of these openings, while the others allow of observations being made of the bulb. The box is filled with water, which, by means of four vertical pipes surmounting spirit lamps, is maintained at a constant temperature above that of the radiant heat, at this point, of the light-source to be measured and compared. In practice about 100° Fah. is found sufficient. The radiometer bulb contains, *in vacuo* as usual, a disk movable round a vertical axis; the half disk on each side of the axis being black and the other white. Suppose, now, a single source of light to be directed on the bulb from one side, it attracts the white half and repels the black, so that the disk turns edgewise to the light, and presents a side view to the observer in front. If another light of equal brilliancy acts simultaneously on the other side, and at the same distance from the disk as the first, the counteraction of the two lights results in the disk presenting its sides to the direction of the light and its edge to the observer. When unequal lights are to be compared, the disk or one of the lights may be shifted until the relative distances of the two sources determine their intensity in the usual way. It is stated that the apparatus is not patented.

Correspondence.

The Principle of Mutual Accumulation.

To the Editor of the Scientific American:

In the issue of your SUPPLEMENT, date of November 19, appears a special article by Dr. Gustave Glaser. This article contains some historical remarks that I am sure you, with the usual American desire to give every man a fair hearing, will allow me to object to. Dr. Glaser offers therein what he is pleased to think unimpeachable evidence of the prior right of Dr. Werner Siemens to the discovery of the principle of "mutual accumulation" in dynamo-electric machines. But Dr. Glaser is too evidently biased. He does not accord to Sir Charles Wheatstone that preparation of a great discovery that he accords to Dr. Werner Siemens, unwittingly thereby paying Sir Charles the greater compliment, since he acknowledges a difference only of a month in publication. Now, sir, I have had the honor of having been chief assistant to Sir Charles Wheatstone for a considerable period, and the greater honor by hard work to have been placed in close familiarity with so eminent a man of science, who was pleased to show me, many years before this claim of German priority became so pressing, the notes of his experiments on this principle of "mutual accumulation," made several years before publication. Before his death, however, Sir Charles told me that he believed that priority was really due to Hjorth, the Swedish electrician. As Sir Charles Wheatstone has been dead some years, I have, of course, no personal interest other than that due to the memory of an old master, in claiming for him the priority due to him, except it be a new version of the trite saying, "Dead men can tell no tales" (for themselves).

Dr. Glaser says: "But by a comparison of both lectures it is plain to see that Mr. Wheatstone mentions nothing that had not been said six weeks before publicly by Dr. Werner Siemens in Germany." There is, sir, a great deal, which even the Dr. C. William Siemens, of London, is good enough to acknowledge in his paper read before the Royal Society recently on March 4, 1880. PAGET HIGGS.

Self-Acting Car Couplers.

To the Editor of the Scientific American:

In an article from W. S. Huntington, published November 19, on requirements for car couplers, he says: "Any number of cars coming in contact should be coupled automatically; but it should be so arranged that no coupling will be effected unless so desired."

Admitting, for the present, that the first requirement has been filled, does Mr. Huntington believe that it would not be practically easy to fill the second requirements? It is so natural for most draw heads not to couple that a hundred different modes can be suggested to prevent an automatic coupler from working, but with all of them it is necessary for the brakeman to do something; either pull a chain, drop a pin, or move a lever, thus throwing some obstruction in the way of or changing the position of the parts and preventing coupling. But if they are left in that position, the next time the draw heads came together they would not couple, and so would not fill the first requirement until the obstruction was removed and the parts rearranged. So that simply to keep the cars from coupling, it is necessary to make two trips, one to set the obstruction and one to remove it afterwards.

Another of Mr. Huntington's requirements is that the draw heads can be uncoupled from the ground or top of the cars without going between them. If this was complied with would it not be much easier, quicker, and safer to allow the cars to couple and then go there and uncouple them, making only one trip instead of two?

Of course, with an automatic coupler, it is necessary, after uncoupling, that the draw head remain uncoupled until the cars separate; and it is also necessary that the uncoupler adjust itself, so as not to prevent another coupling. These last are practical, but think it will be some time before a draw head is invented that will decide for itself when the brakeman wants it to couple and when not to. F.

AN interesting note from Paget Higgs, the well known author of the work on "Electric Light," and of other volumes, appears in this column. He corrects the statement of a correspondent who gave to Dr. C W. Siemens the priority of the "mutual accumulation" principle.

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RECENT INVENTIONS.

A strikingly novel improvement in pillows and bolsters has been patented by Mr. William T. Doremus, of New York city. The object of this invention is to prevent the stuffing of pillows and bolsters from being crowded out of place by pressure applied to parts of the said pillows and bolsters. The invention consists in a pillow or bolster formed of a central roll surrounded by two or more parallel rolls, connected with the said central roll along its sides. This not only prevents the stuffing from being crowded out of place by use, but the pillow can be adjusted for the head to rest upon one of the surrounding rolls or in the space between two rolls. Some of the rolls may be made harder than others, and thus allow the user a harder or softer support for his head.

A patent has been granted to Mrs. Helen M. Snyder, of Pine Bluff, Ark., for an improvement in preparing, painting, and mounting photographic pictures. The object of the invention is to produce colored photographic pictures mounted on plain or curved surfaces, and which shall be durable and superior in appearance. The invention consists in a process which is divisional into four parts, namely: first, saturating the picture by immersion in melted paraffine; second, heating by immersion in hot water to render the picture pliable and transparent; third, attaching the picture to heated glass coated with paraffine; and fourth, rubbing down the picture while kept warm. Photographic pictures thus prepared and treated are superior in transparency and beauty, permanent, of brilliant color, and free from bubbles and discolorations; also, when painted on the face, give better opportunity for artistic work, and may be perfectly sealed to curved surfaces.

An improvement in children's carriages, which is valuable for the safety it secures, has been patented by Mr. Hiram Seaman, of New York city. The object of the invention is to prevent accident from the wheels of the carriage running over obstructions, and also by rolling down inclines when the carriage is unattended. The invention consists in hanging the forward axle of the carriage at its center on a spindle which projects from the forward end of a longitudinal rod that connects at its back end with the rear axle of the carriage. By this construction either front wheel is free to rise in passing over an obstruction without tilting the carriage body, and the forward axle can be turned to anchor the carriage.

Mr. Ambrose A. Hastings, of Newark, N. J., has patented certain useful improvements in lamps. The object of this invention is to improve the light-giving qualities of lamps and secure greater safety in their use. To these and other ends the globe or part globe of the lamp is made of one piece with the oil chamber; the neck of the lamp, which is grooved, and the burner-collar, which is formed with a flange, have combined with them a rubber packing ring and a clamping plate secured by a nut, whereby the burner collar is firmly connected with the lamp; the part globe, which is stationary, is formed with recesses, and has combined with it an upper removal part, and spring buttons applied to both sets of recesses to hold the two parts of the globe together, and whereby the upper part of the globe may be readily removed; also there is combined with the stationary part of the globe and the clamping plate a key for operating the stem of the wick feeder, held disengaged from said stem by a spring, whereby the wick can be adjusted without interfering with the removal of the burner.

Mr. King G. Streeter, of Littleton, N. H., has patented a very neat and durable glove fastening. In this device a tubular shank, having an eye on its outer end, is secured to the glove on one side of the wrist opening. Through this eye is loosely fitted a wire bent in reverse directions at its opposite ends, which latter have knobs that prevent the wire from dropping out of the eye. In using the fastener one end of the wire is passed through the buttonhole in the glove wrist, and said rod or wire then used as a lever to draw the parts of the glove wrist together. The other end of the rod is next passed through the button hole, and the rod afterward adjusted to bring its central portion within the eye. The buttonhole is fitted with an oblong eyelet to prevent the glove wrist from being worn or torn around the buttonhole.

Improvement of Cattle Cars.

In their bid for an improved cattle car the American Humane Association laid down as a requisite the ready adaptation of the new device to old cars. A pioneer in the invention and introduction of cars for transporting cattle humanely writes us that his long study of the problems involved have made it plain to him that old cars cannot be satisfactorily altered to meet the conditions required. He says:

"To successfully feed and water cattle in a railroad car, and give them opportunity for rest, the animals must be separated, each one being placed in a separate stall or compartment.

"The separating partitions must be made *flexible*, *yielding*, or *elastic*, so that the animals cannot be injured by the jerking of the cars, and so that they will yield when the animals lie down.

"They must be made *adjustable*, so that the width of stalls can be changed to suit animals of different sizes, and they must be made *removable*, to facilitate the loading and unloading of the cattle, and so that the car body may be cleared for the loading and carrying of ordinary freight on return trips.

"A transverse position of the stalls has been proven to be the most simple, practical, and economical.

"Practical trials have demonstrated that the feeding and drinking troughs may be one and the same, hinged to fold into the wall space of the car when not in use, or covered with a suitable lid when not in use.

"Each car must be independently organized, so that it will be a complete stable within itself—that is, it must have troughs and water tanks and feed bins, to carry at least one day's supply of feed and water for the animals in the car, so that in case of drought or of accident or detention to trains the animals may still be fed and watered.

"The water tank should be in the roof of the car or underneath the floor of the car, out of the way.

"The feed bins should be on the roof of the car, and this, together with the water tank, should be so arranged that the attendant from the top of the car can feed and water the animals, if need be, while the train is in motion."

To meet these conditions satisfactorily, he affirms, new cars must be constructed.

It is possible, however, that some of our inventive readers may think differently. It is certain that a successfully altered car, infringing no devices already patented, would be a desirable property, as well as the means of hastening the much desired reform in the carriage of live stock.

The Bulk of a Ton of Coal.

The newspaper discussions of the tricks of the retail coal trade and the too common practice of delivering short weights have brought into prominence the question of checking the dealers' weights by cubic measurements. The following table for determining by measurement the weight of coal was given the *Herald* by a presumably honest dealer:

Color of Ash.	Name of Coal.	Cubic Feet to 2,000 lb.	Cubic feet to 2,240 lb.
White	Honey Brook	34·5	38·6
White	Hazleton	34·8	38·9
White	Sugar Loaf	34·8	38·9
White	Old Company's	34·8	38 9
White	Spring Mountain	34 8	38·9
White	Greenwood	34·8	38·9
Pink	Cross Creek	35·1	39·2
Pink	Council Ridge	35 1	39·2
Pink	Buck Mountain	35·1	39·2
White	Locust Mountain	35·5	39·6
White	Mahanoy	35·5	39·6
Gray and red	Shamokin	36·9	41·0
Red	Lorberry	37·3	41·4

Another gives a table by which small consumers can determine by barrel measure the weight of coal delivered. Using for a measure an ordinary flour barrel, the following are said to be average measurements for stove, egg, or grate coal. Furnace coal will measure a trifle less, and nut coal more.

One Ton	Barrels.
Lehigh coal will give	8½ @ 8¾
Scranton will give	9¾
Lackawanna will give	9 @ 9⅛
Red ash (varies greatly) will give	8¾ @ 10
Reading (hard white ash) will give	8½ @ 8¾
Locust Mountain will give	8¾
Cumberland will give	9

The Utilization of Refuse.

A system of destroying the noxious properties of refuse and converting it into more or less useful matter has now had a fairly extended trial at several towns in England, notably Leeds, Blackburn, Warrington, and Derby, and has been found fairly successful. Leeds has led the way in these improvements, and the municipal authorities are satisfied with the result. The furnaces and other appliances were designed by a Mr. Fryer, of Nottingham, and their first practical trial was made at Burmantofts, about two miles from the Town Hall of Leeds, by the erection of a six-celled destructor and a carbonizer. The destructor consists of six (or more) compartments or cells, built in brick, lined with fire brick, and tied together with iron rods. It occupies a space of 22 feet by 24 feet, and is 12 feet in height. An inclined road leads to a platform over the top, and another incline leads from the level of the firing floor to the adjoining road. Each cell is capable of destroying or carbonizing seven tons of refuse in twenty-four hours, and to secure the greatest economy, the work goes on uninterruptedly. The cells consist of a sloping furnace, with hearth and firegate covered by a reverberatory arch of fire brick, with one opening for the admission of refuse, another for the escape of the gases, and a furnace door for the removal of clinkers. The refuse is emptied on the platform, and shoveled into the cell, falling first on the incline, thence reaching the sloping hearth, whence, when sufficiently dry, it is pushed on to the fire, where, owing to the radiant heat of the firebrick arch, it burns fiercely, the products of combustion being gases, a fine ash, and clinkers. Every other cell is provided with an opening large enough to take in infected bedding, mattresses, etc., as well as diseased meat. The gaseous products of combustion pass through a flue to a boiler, which supplies steam to a horizontal engine driving two mortar mills. In these mills the clinkers are mixed with lime, and ground into an excellent mortar, which sells readily at 5s. a load; while the tin cans and iron are sold for old metal. No fuel of any kind is required, the cinders and other combustibles found in the refuse supplying all that is needed.

During the year 1879 the following is an account of the work performed by the Burmantofts destructor: 14,000 tons of rubbish; 190 beds and mattresses; 264 carcasses of pigs attacked by some fever; 1 cow, 10 sheep and lambs, 28 quarters and 13 cwt. of bad meat. The staff required for each "shift" comprises a foreman, who acts as engine driver, four furnacemen, and one laborer. Besides the destructor there is also a carbonizer, which is necessarily built in a different manner, as it is used to convert street refuse and vegetable matter into a charcoal, which sells at the rate of 30s a ton. The carbonizer consists of a group of brick cells, each having a separate furnace. It is 26 feet long, 12 feet wide, and 15 feet 6 inches high. The "shoot" is fitted with sloping plates, which project from its sides, and form a kind of spiral cave or ledge, which, near the bottom of the cell, takes the form of a fire block, resting on a wall which divides the contents of the cell from the gases of the fire. The vegetable and other refuse to be converted into charcoal is filled into this chute or well in a solid mass, the eaves or ledges forming on their underside a flue, so that the matter is gradually heated as it slips down the well, until, at the bottom, it is surrounded by nearly red-hot fire brick. The charcoal is withdrawn at the bottom, and is placed in a cooler worked by the steam engine, and each cell is capable of treating 2½ tons of vegetable and street refuse in twenty-four hours. The cost of a complete establishment, with a six-celled destructor, an eight-celled carbonizer, boiler, engine, mortar mills, buildings, etc., is £4,500. No nuisance of any kind is experienced in the vicinity of the depots, and the refuse which might, under other circumstances, be deposited in places where it would become the hotbed of disease, is effectually destroyed or utilized.—*Building News.*

What is the Cause of Plugs or Putty Holes Showing?

As for the above there are a great many answers given. Almost every painter you ask will give you a different reason, while the majority of them will tell you when the plugs show that it is the fault of the body-maker in not putting them in right, and the body-maker will tell you that it is the painter's fault, and so it goes.

We have heard some men tell us the way they overcame this difficulty of keeping the plugs from showing, which is to avoid putting any glue in the hole; glue the edges of the plug only, and as you drive it in, avoid coming in contact with the head of the screw, because if you let it touch the screw the wood is temporarily upset, and as it seeks its natural condition, and being free to expand but one way because of the screw head back, they are bound to come beyond the panel on the outside surface, but if they are not driven back upon the screw head it will be more than likely, instead of showing on the outer surface, to go the other way, which would prevent it from showing.

Be this true or not we cannot tell; but there is one thing certain, they show, and the painter cannot stop this, and therefore should not be to blame. There are very few places where there are plugs put in that they do not show, and how to remedy it, so far as the painter is concerned, will remain a mystery.

In puttying nail holes or screw heads, we do not favor the plan of most body-makers putting the brads or screws in as deep as they can get them without going clear through the panel, as it is very hard to get the lead color in these deep holes. But where this is the case, we must do the best we can with the priming and leading. We must get in the holes all we can, and as far as we can, and then take some hard drying putty and fill the holes about half full, and when this is dry fill up the rest of the holes. This putty, we think, is the best, because it dries firmer and harder, and there is not so much danger of shrinkage as there is in putty made of whiting. The first puttying in a deep hole cannot dry as quick as the outer part, on account of the air not getting to it so well. If you should putty them full with the one puttying, there will invariably be trouble with shrinking or swelling of the putty. Some painters do not use putty for brad holes, but fill them up with paint and filling. Should there be any places that are not entirely filled up after the body is rubbed down they then use the putty. We have no experience in this way of working, but give it as one of the methods described to us.

We have seen brads and screws where they have been put in level with the surface or a little below, after being puttied and painted, and no trace of them could be found, and sometimes remained hid a great deal longer time than some that are put in deep; but of this you cannot convince the woodworker or get him to acknowledge any of the theory presented on this question.

Now we have seen the brad level with the panel and no putty used, and yet show as if it had been puttied, and the putty swollen out. This, we think, is caused by not having thoroughly seasoned wood, and is occasioned by the shrinking of the panel. Some painters imagine the putty is more inclined to show by the wood swelling than by its shrinking, because, as they say, in driving a brad or nail into the wood, the wood being pressed away to make room for the nail, the damp weather will swell the wood around the nail, and thus force the putty out. We have noticed the swellings do not look the same at all times. Sometimes very bad, and again hardly visible to the eye. Whether dampness causes this, we are unable to say, but are inclined to think it has somewhat to do with it.

The only thing we can do is to use thoroughly seasoned lumber, have the woodworker to drive the nail or put the screw in so as to require the least amount of putty, and then for the painter to let the putty as well as the paint have time to dry. We have seen painters putty a job, and a few hours

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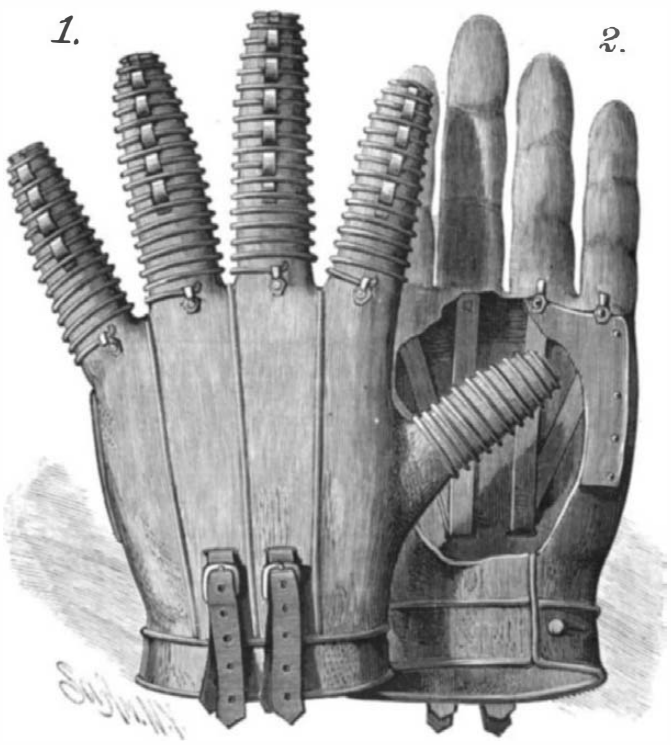
afterward give a coat of paint, so that he may finish the puttying the next day; now it has been puttied twice before the first has had time to dry, and consequently will show every place where there is a nail or screw, because no precautions have been used against it.—*Carriage Monthly.*

NEW HUSKING GLOVE.

The engraving shows a device for protecting the parts of a glove most exposed to wear in husking It is applied to a glove of ordinary make, and consists of a coil of wire surrounding each finger and the thumb of the glove. The coils are fastened at the front and back by means of small metal clips riveted to the glove. These clips are sustained by straps fastened to the same rivets, and extending down the back of the glove to a point near the wrist, where they pass out through slits in the glove, and are received by buckles attached to the wrist portion of the glove, so that the straps can be tightened or loosened to sustain more or less of the strain on the fingers and back of the glove.

This invention was lately patented by Mr. J. F. Glidden, of De Kalb, Ill.



GLIDDEN'S HUSKING GLOVE.

Arsenic and Vanadium in Caustic Soda.

Since caustic soda is no longer exclusively made from crude soda and lime, but is also produced directly from red liquor, the product is often contaminated with undue proportions of chlorides, sulphates, carbonates, even nitrites, and sometimes cyanogen compounds. The author has now also met with arsenic and vanadium in caustic soda. The latter impurity may be disregarded, being rare and very minute; but the former is more serious. A sample of this caustic soda, dissolved in dilute sulphuric acid, and the solution tested directly in Marsh's apparatus, yielded a strong arsenic mirror. Assay by means of precipitation with hydrosulphuric acid, etc., yielded 0·16 per cent of arsenic acid. The same sample contained also 0·014 per cent of vanadic acid. The latter may be recognized by passing through a solution of the caustic soda a current of hydrosulphuric acid, when the liquid will finally assume an intense reddish-violet. This is filtered and acidulated with dilute sulphuric acid, when a precipitate will be obtained, which, after being washed, will produce with borax a yellow bead in the outer blow-pipe flame, and a green bead in the inner. On heating the precipitate in the air, a reddish-yellow mass is obtained, which is soluble in ammonia with a yellow color. The latter solution, slightly acidulated with hydrochloric acid, yields a bluish-black precipitate with infusion of nutgalls.—*Dingler's Pol. Jour.*

NOVEL TROTTING SULKY.

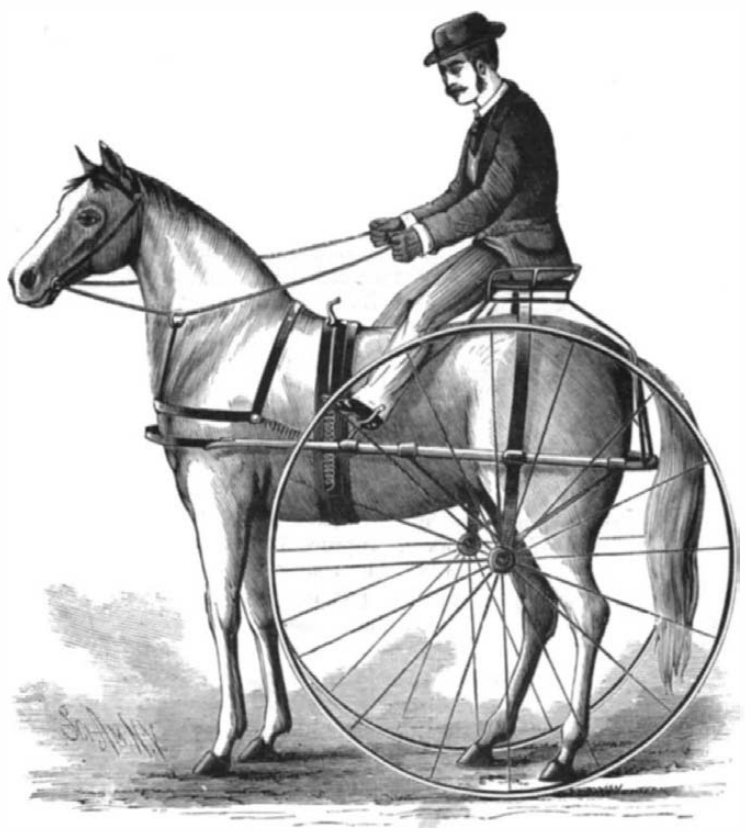
The axle of the sulky shown in the cut is curved upward and extends over the horse. The horse travels between the wheels, and the driver's seat is at the summit of the axle.

The shafts, formed of a continuous piece, meet in a curve at the rear of the horse, and are attached to the axle at a suitable height.

To prevent the irregular movements of the horse's body from being transmitted to the vehicle, the inventor attaches springs to the upper and lower side of each shaft and to the harness saddle.

It is claimed that this improved sulky is safer than those of ordinary construction, and enables the horse to make greater speed.

This invention was recently patented by Mr. C. F. Stillman, of Plainfield, N. J.



STILLMAN'S TROTTING SULKY.

A Plague Among the Violets.

Another interesting problem for microscopists to solve is the cause of the disease which has broken out among the violets, an account of which was lately given by a leading florist.

When the disease commenced its ravages, some three years ago, violet growing was so far in the hands of a single producer that he had won the titular dignity of the violet king among New York florists. His vast plantation was wrecked in one summer, and he was financially prostrated by the operations of an invisible enemy. The season had been rather dry, and the blight was attributed in this special instance to the substitution of well for brook water in irrigating the plants. Experience soon furnished an emphatic negative to this theory, and showed that the disease was a true blight, like the potato rot, the vine disease, the pear tree blight, and similar destructive agencies that infest the vegetable kingdom. In the violet the disease makes its appearance while the plants are in blossom. The first symptom is the development of nearly circular spots on the petals of the flower, which resemble the spots caused by the concentration of the beams of the sun upon the surfaces of the leaves of plants by the refractive agency of raindrops after a summer shower, the globular and lenticular shape of the drop rendering it equivalent to a minute burning glass, concentrating the rays of the summer sun upon the surface beneath, and completely destroying the delicate vessels thus exposed to intense heat. After this symptom appears, the destruction of the plant is a question of a few hours only; the leaves become limp and wilted, the stem withers from the root, and the delicate organism is soon transformed, from the minutest rootlet to the tip of the leaf, into a dry and lifeless effigy. The origin and natural history of the violet blight have not yet been investigated.

Poisonous Perfumes.

Various cases of poisoning from the use of perfumes have been reported in recent English journals. In one instance a little girl had bought some heliotrope perfume at a bazar, and had applied it on her face. This caused a vesicular eruption, swelling, itching, and in fact erysipelas, which lasted for some time. The scent was made with some of the products of coal tar, and not with the odoriferous principles of plants, thus acquiring its irritating properties.

MECHANICAL INVENTIONS.

Mr. Andrew Hein, of Trenton, Mo., has patented an improved vehicle wheel, by which friction is reduced. The object of this invention is to facilitate the construction and easy running of vehicle wheels. The invention consists in providing the hub of the wheel with metallic bands having end cups adapted to contain boxes that carry rollers which bear on the inner circumference of the said cups or hub band extensions. The whole weight of the axle and the load supported by it rest on the rollers which run on the inner faces of the cups, so that the vehicle wheel will move more easily.

A very simple and useful improvement in clocks for night use has been patented by Mr. Ferdinand A. Jaekel, of Cincinnati, Ohio. The object of this invention is the production of a clock the dial and hands of which may be projected upon a canvas or similar surface, like the pictures of a magic lantern, so as to be plainly visible at night. The invention consists in a transparent dial behind which is to be arranged a light, and which has a central stud that carries two wheels, arranged one behind the other, the central portions or bodies of which are also transparent, and have delineated on them, respectively, an hour hand and a minute hand. These wheels mesh with cog wheels on the hand arbors of a clock movement, which may be supported by a stand formed by a chamber for holding the light in rear of the transparent dial. By this construction and arrangement, all the advantages of an illuminated clock are obtained at a comparatively small cost.

An improvement in thill couplings, which provides for a ready and convenient coupling and uncoupling of the thill, firmly holds the latter to the axle, and avoids accidental uncoupling, has been patented by Mr. Harbert K. Forbis, of Danville, Ky. In this invention the thill is united to the jaws of the clip by a bolt or pintle which has an angular arm fast on its back end. This arm, when the thill is coupled, rests on the axle, and is held against the same by a spring latch bolt, the nose of which is beveled to permit of said bolt being forced back by the arm when the latter is adjusted to bear on the axle, after which the spring shoots the bolt and locks the arm. This prevents the removal of the pintle except by holding back the latch bolt and moving the arm of the pintle away from the axle.

A very useful invention, in the shape of a square attachment for saw blades, has been patented by Mr. Thomas U. Mekeel, of Poughkeepsie, N. Y. In this invention the heel portion of the blade of a handsaw has attached to it, by a pin passing through the blade, two bars or strips, that is, one on each side of the blade. These bars are formed with their edge or face toward the point of the saw straight and true. They constitute the head of the square or bevel, and can be turned on the pin which attaches them to the blade, either one independently of the other, to bring their faces at any angle to the back edge of the saw. Ordinarily they will be retained at right angles, in which position they may be held by a spring catch. This invention combines two tools that are generally used together, and the attachment, which is inexpensive, can be readily applied without injury to the saw blade. If desired only one pivoted bar may be used.

Mr. William C. Jones, of Coffeeville, Miss., has patented an improved baling press. The press, which is of a very strong and durable construction, offers every facility for baling cotton and other substances with precision and dispatch. It comprises a stout frame having an upper baling box, which is open below for reception of the follower, and has its sides and ends hinged to open downwards for convenience in removing the bale. Said ends fit grooves formed in the sides, and the latter when closed are secured by hooks. The head block fits within rabbets in the frame to allow it to be slid out for convenience in inserting the material to be pressed. The follower is worked up and down by a rotating screw box formed by the hub of a crown wheel, driven by a pinion, on the shaft of which are large and small pulleys for giving a slow pressing movement and quick return action of the follower.

Mr. William W. Wythe, of Ocean Grove, N. J., has patented an improved speed recorder for railway trains. In this improved apparatus the drum, which carries the chart, receives its motion from the axle of a car, by an eccentric on the axle acting against one or other of two pawls attached to levers on opposite sides of the axle, and provided with disks which operate respectively, according to the direction in which the car is moving, upon one or other of two elastic chambers that compress the air within them. These chambers are connected with two other flexible chambers that act upon levers having pawls which engage with a wheel of a train of gear to rotate the drum in either direction. A pencil moves over the ruled paper of the rotating chart in such manner that the diagonal lines produced are in the direction in which the train is moving, thereby obviating confusion in reading the record. This movement of the pencil is effected by a combination with a loose spur wheel of pinions, a spring operated detent, cord, spring drum, and other devices controlling a pencil-carrying rack bar. In this speed recorder compressed air is used not only to produce the movement, but also to indicate the direction of the prime mover.

Mr. James C. Scott, of Manchester, England, has patented an improved dividing engine, which is very ingenious. The invention consists in an arrangement whereby change wheels are dispensed with and an increased accuracy of division is secured. This is accomplished by causing the handle which gives motion to the movable part always to start from the same point, and to finish, after the required number of turns and fractions of a turn, against an adjustable stop on a graduated disk, after which it is turned in the reverse direction back to the starting point, which is a single notch in the disk that a spring-trigger in the handle

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engages with. The apparatus may be used for setting out, cutting, or working divisions on circular or straight lines.

Mr. Fredrick Schneider, of Pagosa Springs, Col., has patented a very useful improvement in open links. The object of the invention is to provide a new and improved open link which is simple in construction and effective and convenient in use. The invention consists in an open link formed of two U-shaped sections provided with internal opposite projections at the ends, which sections are united by a connecting plate provided with recesses in the longitudinal edges to receive the projections at the ends of the U-shaped sections, all these parts being held together by a flat sliding cap and a split spring bolt passing through said cap and the connecting plate.

Mr. William E. Varney, of Daytonville, Iowa, has patented an improved fly-net punch. The object of this invention is to provide a machine for punching holes for the net strands in the leather bars or straps more rapidly and accurately than is now done and without removing any of the leather. The invention consists of a fly-net bar punch, in which a two-pronged fork or punch is reciprocated up and down, within a frame mounted on a table, by means of gearing and a flywheel shaft connected by an eccentric with the punch shaft, and in which the strap or bar to be operated upon is intermittently and automatically fed along the table by mechanism deriving its motion from the flywheel of the device. With this machine the work of preparing the straps or bars for fly netting for horses, etc., is performed with great economy of time and labor.

An improved vehicle gear, the object of which is to provide easier riding springs for buggies and other vehicles, has been patented by Mr. William Lockwood, of Madrid, N. Y. The invention consists in a combination of semi-elliptical springs, centrally secured on the top of the side bars in direction of the length of the latter, and curved end springs passing around the side bars up to and connecting with the extremities of the semi-elliptical springs. This improvement forms a very simple, easy, effective, and economical spring gear.

Mr. John M. Doyle, of North Springfield, Mo., has patented an improved bench dog. The object of this invention is the production of a movable and adjustable bench dog for carpenters' use, and it consists of a notched sliding rack bar or claw and a pivoted toothed lever secured in an angle frame, which frame is adapted to be attached to the bench by means of a lateral bolt or arm entering holes in the side of the bench. A ratchet construction of the frame and a pawl on the lever provide for locking the claw up to the work, and for releasing it therefrom when required. The simplicity and utility of this invention will be apparent to every carpenter.

The Mines of Tasmania.

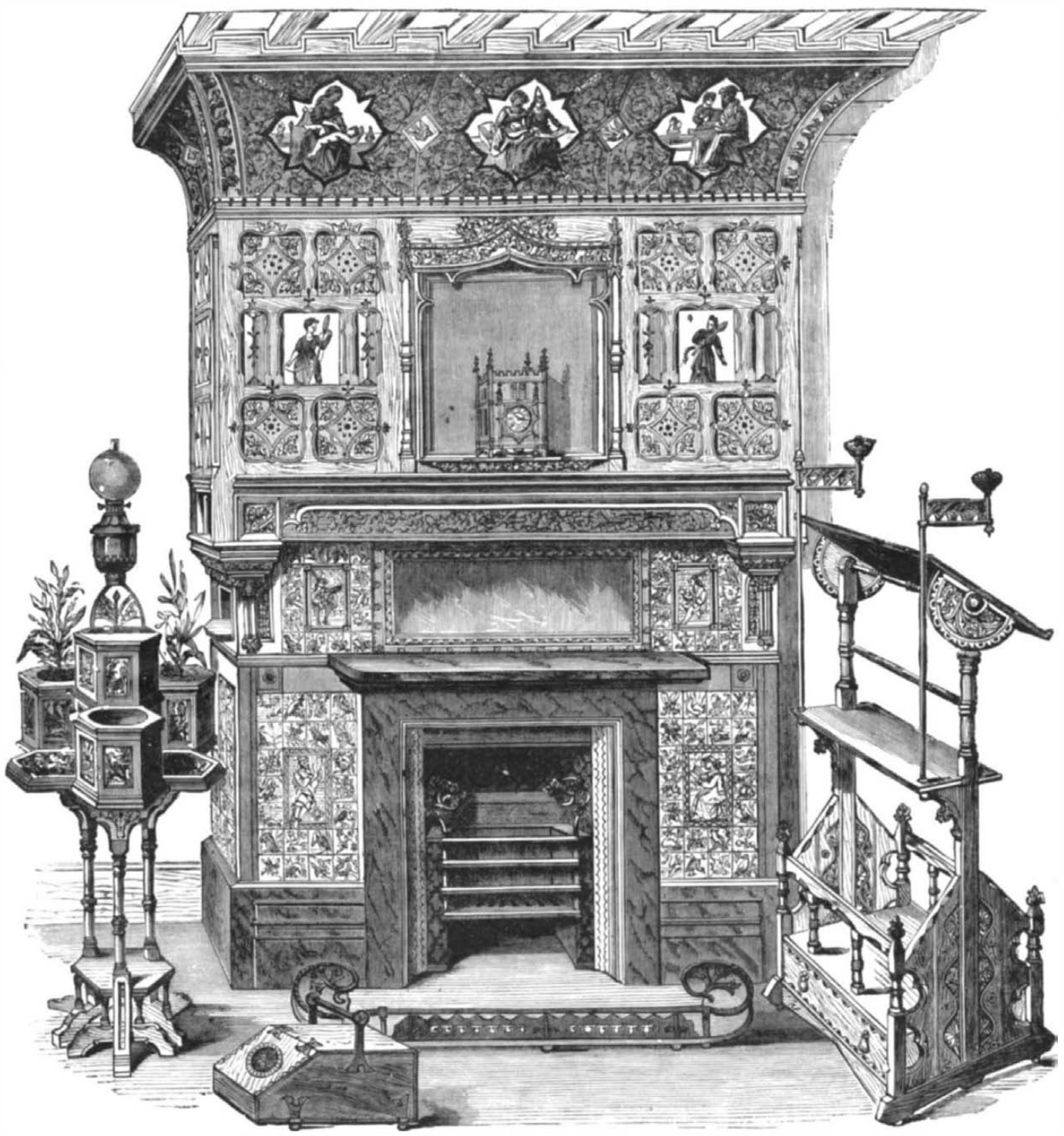
A serious mining fever has been developed in Tasmania—the old Van Diemen's Land—based chiefly upon tin. The Mount Bischoff tin mine, described as a mountain of metal to be quarried rather than mined, is apparently one of the richest if not the richest deposits of tin in the world.

It was in the year 1872 that large deposits of tin ore were first discovered at Mount Bischoff, on the northern side of the island, opposite to Victoria. From the outset the mine in its product of tin proved to be what the Burra Burra of South Australia was first as a copper mine, namely, a deposit so vast as to render superfluous the ordinarily tardy and expensive operations of mining. A mining fever set in, and successively were discovered, not merely many more tin deposits, but also gold, silver, bismuth, antimony, iron, and coal apparently inexhaustible.

From the year 1866 to June 30, 1879, the returns of gold were 48,753 ounces from the alluvial and 72,186 ounces from the quartz.

ARTISTIC MANTELPIECE.

The engraving represents a magnificent mantelpiece made by Messrs. Cox & Sons, of London, England. The wrought metal work is of exquisite workmanship, and the tiles, painted panels, and diapered patterns are thoroughly artistic. The woodwork is workmanlike in its construction, and the whole design, while massive and imposing, has an elegance that is extremely pleasing.



MANTELPIECE BY COX & SONS LONDON ENGLAND.

An Ancient Great Lake in the West.

The last quarterly report of the Kansas State Board of Agriculture contains the following: In the geological development it is conceded by scientists that the eastern portion of Kansas, a portion of Nebraska, Southern Iowa, Northern Missouri, etc., was once covered by a fresh water lake, and this body of water received numerous rivers and smaller streams; and that their turbid waters deposited a sediment, varying from a few feet to 150 feet thick.

Strontianite.

Since it has been shown by Professor Scheibler, of Berlin, that strontium is the most powerful medium of extraction in sugar refinery, owing to its capacity of combining with three parts of saccharate, the idea suggests itself that the same medium might be successfully employed in the arts, and form a not uninteresting subject of speculation for the chemist. Hitherto native strontianite—that is, the 90 to 95 per cent. pure carbonate of strontia (not the cœlestine which frequently is mistaken by the term strontianite)—has not been worked systematically in mines; but what used to be brought to the market was an inferior stone collected in various parts of Germany, chiefly in Westphalia, where it is found on the surface of the fields. Little also has been collected in this manner, and necessarily the quality was subject to the greatest fluctuations. By Dr. Scheibler's important discovery a new era has begun in the matter of strontianite. Deposits of considerable importance have been opened in the Westphalian districts at a very great depth, and the supply of several ten thousand tons per annum seems to be secured, whereas only a short time ago it was not thought possible that more than a few hundred tons could in all be provided.—*Chemical News.*

Ammonia in Pulmonary Diseases.

At the meeting of the Royal Belgian Academy of Medicine, April 30, 1881, M. Melsens presented a memoir on the therapeutic applications of ammonia, its salts or its complex compounds, requesting that a committee be appointed to examine into the value of his conclusions relative to this question. M. Melsens' communication discusses the applicability of ammonia and its compounds to diseases of the respiratory organs, He concluded, from the fact that phthisical patients are benefited by inhaling the vapors of carbonate of ammonia emanating from stables, that the continuous and moderate inhalation of that salt would be efficacious in other pulmonary affections. He accordingly made the experiment upon himself during an attack of bronchitis, by wearing in a bag attached to his shirt several pieces of ammonic carbonate. Having been completely cured in a few days by this treatment, he subsequently employed it in his practice, with uniform good results. He also applies the remedy directly to the respiratory passages, by means of the spray, with equal success.—*Bulletin de l'Académie Royale de Médecine de Belgique.*

Carbolic Powder.

A dry powder, containing a definite quantity of carbolic acid, in which form the latter is most easily used as an antiseptic, is prepared, according to a Berlin journal, as follows: 60 parts of rosin and 15 parts of stearine are melted together with a gentle heat, and when the mass has somewhat cooled, but is still liquid, 25 parts of carbolic acid are added. The mixture is then mixed with 700 to 800 parts of precipitated carbonate of calcium, and by careful trituration reduced to a uniform powder. This is to be applied by means of a sprinkling box, which may be securely covered after use.

The powder may be applied either directly to wounds and sores, so as to produce an antiseptic scab, or it may be used for the extempore preparation of carbolized jute dressing by placing several layers of jute, each separately dusted over with the powder, upon each other.

Cotton Spindles in Fall River, Mass.

The latest published statistics, as found in Earl's "Fall River and its Manufactories of 1880," indicate that very considerable additions have been made to the number of spindles in the city. On the first of July last there were 1,429,412 in operation in the city. At the time of the publication of Earl's book there were 1,364,199. This increase does not include any of the new mills. The new Border City, Sagamore, Shove, Bourne, Globe yarn mill, and the new corporation recently formed will add over 200,000 spindles more, making over 1.629,412 spindles in the city.—*Providence Journal.*

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ENGINEERING INVENTIONS.

An improvement in presses for compressing meal, bran, cotton seed, sawdust for fuel, and other materials into cakes, has been patented by Mr. John W. Fredrick, of Indianapolis, Ind. This invention relates to hydraulic presses used for compressing various materials into cakes, and has for its object the quick removal without breakage of the compressed cake. The material to be compressed is packed within a press box, which is open at its ends, and the box then placed on one of its ends within a cap which is mounted on the ram. Power is next applied to the ram to raise the box on a fixed cylinder, which enters the box at its opposite end. When sufficient pressure on the material has been thus obtained, the box is further raised by supplementary means, and blocks are arranged between the cap and bottom of the box and the ram again raised, which causes the compressed cake to be forced out of the bottom of the box. The invention is a perfectly practicable and useful one.

An improved car coupling, which combines with it a cushioned bumper and furnishes a yielding drawhead, has been patented by Mr. Darwin S. Walrath, of Ingham's Mills, N. Y. In this coupling the frame of the device and drawhead are mounted in slots formed in the beams of the car platform, with a spring between them, and both have a limited longitudinal movement in opposite directions. When the cars are ready for coupling, a crossbar, which engages the connecting bolt, rests on a table formed on the bumper head which has been forced forward by the spring of the intermediate bumper when the cross bar was raised by an uncoupling lever. The cars having been brought together the connecting bolt or link enters the bumper head and forces it back against the bumper, which is a double or compound one, the springs of which absorb the concussion. In the meantime the crossbar has dropped from its supporting table into position in front of a projection on the connecting link, which is thereby prevented from being withdrawn. One of the springs of the compound bumper is heavier than the other, so that the power for drawing the car will come against the rearward thrust of that spring, which thus furnishes a yielding draw for the car.

In improved sectional steam boiler, which is economical of fuel, quick to generate and superheat steam, easy of repair, and occupies but little ground room, has been patented by Mr. Milton W. Hazelton, of New York city. The body of the boiler consists of a central upright cylinder provided with a series of radiating tubes, closed at their outer ends and arranged in successive planes one above the other, the tubes and spaces of the several series alternating with each other. A series of vertical tubes are set in the spaces between the outer ends of said radiating tubes, and arranged to extend from near the water line above these tubes to the bottom of the central cylinder, and communicating at their ends by horizontal pipes with said cylinder. A tubular water jacket is formed around the fireplace by a double series of vertical and horizontal pipes connecting with the central cylinder, and the steam chest, at top of the boiler, is fitted with vertical smoke-flues for superheating the steam.

Mr. Charles Ebel, of New York city, has patented an improved hydrant. This invention provides, in a very simple and effective manner, for emptying the nozzle pipe of a hydrant of water in cold weather, to prevent injury from freezing. To this end the stem of the valve which controls the admission of water to the nozzle pipe is extended downward below said valve, and carries on its lower end a reverse valve which, when the nozzle pipe valve is closed, opens communication between a lower extension of the nozzle pipe and a waste chamber, which is arranged below it, and which is fitted with a pipe that connects with the sewer, thus allowing any water that may be left in the nozzle pipe to run off. A separate valve is used to close this pipe that connects with the sewer whenever it is not necessary to empty the nozzle pipe, as, for instance, during warm weather.

An improved car coupler, which is simple, strong, and durable, and allows of the cars being coupled and uncoupled without dangerous exposure to life or limb, has been patented by Mr. Oliver S. Riggs, of Allenport, Pa. This invention relates to that class of couplers called "self-couplers;" and it consists of a flaring mouthed drawhead containing a pivoted elbow drop-catch for engaging the coupling link, held down by rod and spring and raised by lever, and containing, also, a curved plate rigidly secured in rear of the drop-catch for guiding the coupling link and holding down its engaged end. The lever which raises the drop-catch is an elbow one arranged on the exterior of the drawhead, and may have attached to it a rod extending forward for the engineer to uncouple the cars while in motion.

Mr. William Johnstone, of Ottawa, Canada, has patented an improved steam boiler. The invention consists in a combination with an upper cylindrical chamber, which forms both a water and steam receptacle, of an annular lower water chamber surrounding the grate, upright water tubes connecting said chambers and forming the exterior wall of the boiler, drop tubes for containing water depending from the upper chamber into the fire chamber, and a series of short upright tubes projecting from the lower annular chamber at the feed opening to the fireplace and connected by a cross pipe with the upright tubes which connect the upper and lower chambers. This constitutes a cheap and efficient boiler for generating steam for mechanical uses, for heating dwellings, and for other purposes.

An improved boat lowering and detaching apparatus, which is both rapid and safe, and is automatically released when the boat touches the water, has been patented by Mr. Albert Willis, of Colusa, Cal. The invention consists in an upright at each end of the life-boat, to the top of each of which uprights a short arm or beam is pivoted, the loose end of which passes into an aperture in a beam pivoted to the lower end of the upright, this upper beam being held in the aperture by a safety chain and by a pintle passing through a ring attached to a string or chain fastened to the davit, whereby when this string is drawn taut by the descending of the boat the ring pulls the pintle out of its aperture, so that the lower beam can drop when relieved of its strain—that is, when the boat floats—thus permitting the upper arm to swing upward and the ring of the pulley block to slide from a hook on the upper pivoted beam, thereby causing the boat to be detached from the pulley.

Messrs. Watson P. Widdifield and Anson T. Button, of Uxbridge, Ontario, Canada, have patented an improved car brake. The object of this invention is to provide an efficient car brake which will permit the brakes to be applied simultaneously to all the cars of a train from a single point, and with an equal pressure. The brake is of that description in which a continuous rod, formed of sections, extends longitudinally with the cars, and is jointed between the latter, said rod sections being coupled for rigid rotation with each other and connected with devices for rotating the rod, and also to the brake devices. The invention consists in a combination with the brake devices and a rotary gear operated directly by the axle for applying them, of a continuous rod or shaft extending throughout the length of the train, and an equalizing device placed between the said continuous rod and the rotary gear. It also includes a coupling of novel construction for the continuous rod, and various other details and combinations, which add materially to the efficiency of the brake.

Mr. Isaac H. Allfree, of Pittsburg, Pa., has patented a very useful valve and valve gear for steam engines. The invention relates to an improvement in valves and valve gear for steam engines, designed to secure a balanced action for the valve, a reverse movement for the engine, and an automatic variable cut-off with great economy of material and space, as well as great simplicity of parts. It is more particularly intended for upright engines. In it the steam cylinder, main valve casing, and reversing valve casing are all cast in one piece in the form of parallel cylinders, and provided with transverse external ribs to form steam ports. The main valve casing is made longer than the steam cylinder, which has ports at its ends, and the reversing valve casing has ports opening into the end and middle of the main valve casing, and both casings are fitted with balanced piston valves, which are double headed and tubular. The invention also includes a combined reversing and cut-off valve and a variable cut-off gear arranged in line with the valve and connected by reciprocating rods or stems having an adjustable connection between them. Means also are provided for definitely increasing or shortening the distance between the valve and its variable cut-off, whereby the valve may be reversed at will and the cut-off gear still be made to coact with said valve in either of its positions. The invention likewise includes other new and useful features.

Action of Coffee and Sugar on the Stomach.

M. Leven has communicated to the Paris Society of Biology some experiments which he has made on this subject on dogs, with the assistance of M. Semerie. The action of coffee on the stomach has been much discussed and variously interpreted; the majority of writers admit that coffee stimulates the circulation and provokes hyperæmia of the gastric mucous membrane, but they have not adduced experimental proof of the fact.

The contrary opinion is supported by a certain number of observers, to whom M. Leven has given in his adhesion. He recalls to mind the experiments which he made some years since on caffeine absorbed by frogs, guinea pigs, and rabbits. It retarded the action of the heart, which, at the same time, became strong; it increased the arterial tension; like the vaso-constrictor agents, it dilated the pupil. Caffeine has even been used in certain cases to replace digitaline, of which it has, to a great extent, the properties, though in a smaller degree.

The latest experiments of M. Leven were as follows: He gave to a dog a meal of 200 grammes of meat; he then administered an infusion of 36 grammes of coffee in 150 grammes of water; the animal was then killed, and, at the end of three hours, the stomach still contained 145 grammes of meat, while in the absence of coffee it only contained about 100 grammes. The abdominal mucous membrane was pale as well on the external surface as in the interior, and the vessels were strongly contracted. It follows, then, that coffee, producing anæmia of the stomach, retards digestion; and, he anæmia repeating itself, ends by bringing on habitual increased congestion of the stomach, which, according to M. Lever, is synonymous with dyspepsia.

It is well known, and English physicians have laid great stress upon this point, that the abuse of coffee and tea often brings on gastralgia, dyspepsia, and, at the same time, more or less disturbance of the apparatus of innervation. It is, therefore, necessary precisely to distinguish the local anæmia produced by coffee on the stomach from the more general action exercised by it over the central nervous system, and which has conferred on it the merited qualification of an intellectual drink. In opposition to coffee, sugar is, according to M. Leven, an eminently digestive substance; and he does not fail to order it in certain cases of dyspepsia. He has made the following experiments: He gave to a dog 80 grammes of sugar at the same time as 200 grammes of meat; six hours afterward there was nothing found in the stomach but 20 grammes of undigested meat. The abdominal mucous membrane was red and turgescent, the liver was wholly congested.

M. Leven draws this practical lesson from his experiments: that the infusion of coffee should be sufficiently sweetened to stimulate the secretory function, and thus assist digestion.—*British Medical Journal.*

The Treatment of Burns.

The London *Medical Record* says that Dr. J. Troizki, in a Russian medical journal, adds his testimony to that already published as to the value of solution of bicarbonate of soda as a dressing for burns. He says that during the previous year he noticed twenty-five cases of burns, mostly of a severe nature. Sixteen of them were received in a fire in a village, during a strong wind, when the inhabitants, in order to save their property, were obliged to work in the flames. In all these twenty-five cases bicarbonate of soda was exclusively applied. The result of this treatment was so favorable that the author considers himself justified in pronouncing this remedy the best and most efficient in burns of all kinds and degrees. Even in extensive burns of the second and third degrees the pain was soon alleviated by the application of compresses soaked in a solution of bicarbonate of soda; and the wounds soon healed, leaving but few scars, and no impairment of the functions of the affected parts. No evil results from this extensive use of bicarbonate of soda, which might suggest the reception of carbonic acid into the blood, were noticed.

As regards the application of bicarbonate of soda in burns, the author distinguishes three methods: (1.) Powdered bicarbonate of soda is strewn over the burned parts. (2.) Linen rags, sprinkled with a solution of bicarbonate of soda (1 in 50) are laid on; as soon as these rags become dry they are replaced by others, or are moistened again in the solution. (3.) Linen rags are applied in the same manner, but are kept constantly upon the burns, and moistened by pouring the solution over them. The first method suffices only for burns of the first degree. Change of the moistened rags is chiefly adapted for burns of the third degree, attended with much suppuration. In exchanging the dry rags the pus which has accumulated underneath them must be carefully washed off, that it may not be received into the blood; and then a fresh rag soaked with the solution must be placed upon the clean granulating surface. The third method is applied solely in burns of the second degree. Changing the compresses would in these cases only irritate the exposed surface, and, by causing a more copious suppuration, delay the healing process. The beneficent effect upon burns of the solution of bicarbonate of soda the author considers to be due to the anæsthetic, antiseptic, and disinfecting property which the bicarbonate owes to the ready disengagement of carbonic acid from it. Herr Troizki has also made experiments with other antiseptic and disinfectant agents, but has come to the conclusion that none are so useful as the soda.

Great Mortality from Snakes and Tigers in India.

It may be startling to Europeans to learn that no fewer than 21,990 persons were killed in India during the year 1880 by snakes and tigers. It is, too, at first sight, eminently unsatisfactory to hear that this loss of life, instead of decreasing with the advance of civilization, has actually increased during the past five years; the number of victims in 1876 did not exceed 19,273. This statement appears almost incredible, and requires explanation, which will probably be found in the greater accuracy with which causes of death have been returned in India in recent years. The largest fatality from snakes and wild beasts occurs in the Bengal Presidency, where during last year 10,064 persons are said to have died from snake bites, and 359 to have been killed by tigers. It appears from the weekly returns issued by the Sanitary Commissioner of the Punjab that during the fortnight ending August 27 last no fewer than 113 deaths resulted from snake bites in fifty two of the largest cities of that province—equal to nearly 3,000 per annum. As the fatality from this cause is probably larger in the rural than in the town districts, it is evident that the province of Punjab must be responsible for a very large proportion of the excessive fatality from this cause in the Bengal Presidency.—*London Lancet.*

Gas Purification by Apatite.

It is announced in a recent number of the *Revue Industrielle* that the first cargo of 500 tons of Canadian phosphates, from the mines at Buckingham, province of Quebec, has been delivered at Bordeaux. Apart from the use of this mineral for agricultural purposes it is proposed to utilize the Canadian apatites (calcium phosphate) in the purification of coal gas, presumably from ammonia. If the process succeeds there will probably be a rise in the value of these phosphates, which already constitute an important branch of industry in the province of Quebec. It is not stated how the apatite is to be used in the purifiers, but it would probably be only employed somewhat after the manner of the artificial superphosphate process for the elimination of ammonia. The mineral will, therefore, be ground and employed in its raw state, with what success remains to be proved, since, although presumably cheaper than commercial superphosphate, it is not so pure and free from inert constituents as the artificial substance.

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NEW INVENTIONS.

An improvement in escapements for watches, etc., whereby a more regular and uniform movement is obtained, has been patented by Mr. Edward Wensch, of Vienna, Austria. The invention consists in an anchor rod pivoted on the top plate of the works, and having its lower end T-shaped, with a tooth engaging with the escapement wheel at the ends of this T-shaped part, and the upper end of this rod provided with a fork surrounding an eccentric on the shaft of the balance wheel, above which eccentric there is a plate with a pin at the edge, which a spring presses against for imparting motion to the balance wheel. By these means the escapement wheel does not directly transmit the motive power of the clockwork to the balance, but the movement depends on the power of the above-named spring which always remains regular. For pendulum clocks, the construction is slightly modified.

An automatic flood gate, which can be removed from the flume very conveniently when desired, has been patented by Messrs. Cornelius B. Bradshaw and James Hewett, of Neillsville, Wis. Combined with the flume is a gate arranged to swing on horizontal pivots, and having an excess of weight below said pivots and an excess of superficial area above the pivots, which may fit in upright grooves in the sides of the flume. If the flume is empty the gate will be inclined and closed by the descent of its heavier lower end, and the water as it enters will be stopped by the gate. When, however, the flume is full, the water will act upon the gate to turn it into a horizontal position, or nearly so, and thus permit of the water flowing out of the flume. This automatic gate will be found to be of great service in floating wood, as it collects a quantity of water, and by suddenly releasing it produces a powerful current to float off the logs. It may be easily removed by an ordinary windlass when required, and, if desired, may be provided with an operating lever and a latch for locking it when closed.

Mr. Asahel J. Goodwin, of Brookline, Mass., has patented valuable improvements in invalid bedsteads. The improvements relate to invalid bedsteads having sectional bottoms fitted for adjustment to vary the angle of the sections to suit the comfort of the patient and the necessities of the case. The object of the invention is to permit a larger range and variety of adjustment than has heretofore been possible, and also to obtain durable construction, combined with convenience of manipulation. The bed bottom is made up of a vertically adjustable central section, and two end sections fitted to swing for varying their inclinations, and one of which is in two parts hinged together. A stretcher also is used. The bed bottom sections are pivoted, and the head one works in slotted socket plates having flanges to form bearings for the pivots, heads on which enter the slots that provide for the removal of the section. Said socket plates, which are applicable to other sections and parts, have circular projections at their backs which enter holes in the rails. An ingenious combination of cams, some of which are formed with folding ends to facilitate transportation, ratchets, racks, pinions, levers, and other devices, serve for adjustment of the sections, both separately and collectively, and for retaining them in position, the whole providing for nearly every possible position of the body.

An improved buckle, for use in securing the ends of straps without sewing or rivets, and especially useful in attaching parts of harness, has been patented by Messrs. James W. Sweyea and William H. Lowe, of Walla Walla, W. T. The invention consists of a two-part box buckle, each part being of tubular form and provided with a wedge-shaped tongue. These tongues serve to hold the ends of the strap or straps in between them and enter respectively the box part of the other, and are formed with pins which engage with holes in the strap ends. One of these tongues is hinged to give room for insertion or removal of the ends of the strap, and is provided with a spring catch to hold the two parts of the buckle together when closed. Any strain on the straps tends to draw the two parts of the buckle more tightly together.

A very compact and useful improvement upon baby jumpers, which mothers and nurses will be able to appreciate, has been patented by Mr. Wesley Roberts, of Martinsville, Ill. The invention consists of a baby jumper which is readily convertible into a small table, and which, when extended to adapt it to its primary use, forms a very stable device for the child to jump, whirl, or swing upon with perfect safety. To these ends or purposes the spring pole of the jumper is hinged midway of its length to admit of its being folded into a contracted space and horizontal position. The support within which the pole plays, and which is provided with a pole-sustaining spring, is also hinged to fold up, the platform, which is removable and forms the table top, rests upon a sliding extension, and hinged wings or supports are provided to give an extended base support to the whole structure.

Mr. David Britton, of Jonesborough, Ill., has patented a fruit drier, which has superior drying facilities and offers increased conveniences for inserting, changing, and removing the fruit. It consists of a drying house having a separable strip in its roof to provide for the escape ofthe moist air and to promote circulation of the heated air, a furnace for heating the incoming air, guiding, and distributing plates for the air to, at the sides of and above the furnace, a series of tracks or ways on opposite sides of the interior of the drying house and arranged one above the other to support tiers of drawers which hold the fruit to be dried, and separable end frames having crossbars and hinged doors to provide for the entry and removal of the drawers with very little waste of heated air.

The International Exhibition and Congress of Electricity at Paris.

OPERA BY TELEPHONE.

The most crowded place in the Exhibition is the *Théâtre de l'Opéra*. Here from eight to eleven on three evenings in the week are to be seen four long *queues* waiting for their turn to enter one of the four rooms where the mysterious music is to be heard. Round the walls of each room are hung telephones in pairs, some twenty pairs in all, and the same number of persons are admitted. On putting the telephones to your ears you hear the music which is being performed more than a mile distant. Some of the singers seem to be on your right hand, others on your left, and it sometimes happens that a particular voice is quite piercing in its loudness. There are in fact ten transmitters disposed along the front of the stage, near the footlights, and ten wires leading from them, two of which are connected with the telephones intended for your two ears. Special precautions are taken to prevent the action of the transmitters from being disturbed by the tremors of the boards under the feet of the actors, the transmitters being supported on India-rubber and loaded with lead. The telephonic apparatus employed is that of the Ader system.

THE DOLBEAR TELEPHONE.

The greatest novelty as regards principle is exhibited in Dolbear's telephone, in the United States department. The receiver has no magnet, but has two parallel metallic plates near together, and electrically insulated from each other. One of them is connected with the line wire, and the other (in the specimen here exhibited) with the return wire. These two wires are connected with the terminals of the secondary coil of a small Ruhmkorff at the sending station; and the voice of the speaker produces variations in the primary current, on the usual plan of varying the resistance in the circuit of a local battery by variations of pressure. The secondary circuit is not completed inasmuch as the two plates do not touch; but the opposite electricities which are transmitted to them attract each other on electrostatic principles, and the plates are thus made to vibrate in unison with the voice of the speaker at the sending station. The instrument exhibited is very effective, and reproduces a whisper with greatly increased intensity. It is claimed that this invention does away with the disturbance experienced in other telephones from currents in the neighboring wires, inasmuch as such currents will not affect the attraction between the plates. We should add that the instrument exhibited speaks fairly even when the plate next the ear is disconnected from the wire intended for it, but of course less loudly than when the connection is made. This is just what one would expect from electrostatic attraction, the attraction of a charged for an uncharged body being less than that between two bodies oppositely charged.

EDISON'S ELECTRIC METER.

We have had an opportunity of seeing the system adopted by Mr. Edison for the measurement of the quantity of electricity consumed in each house which receives a supply from one of his mains. A definite proportion (one thousandth part) of the whole current which goes through the house is shunted through a cell containing two copper plates in a solution of sulphate of copper. The positive plate loses, and the negative plate gains, an amount of copper exactly proportional to the quantity of electricity which passes. There are two such cells in series, one serving as a check upon the other, and the whole arrangement is kept under lock and key, to be opened only by Mr. Edison's agents when they come round to inspect the meters. As the lamps supplied (of a given type) are almost precisely alike in their resistance, and the current, when flowing, is always nearly the same, this arrangement gives a practically accurate measure of the illuminating power supplied.

ITALIAN MAGNETO-MACHINES.

Much interest has been excited by the exhibition of three magneto-electric machines constructed by Prof. Pacinotti, of the University of Cagliari. One of these, constructed at Pisa in 1860, is the earliest example of the principle of the ring-shaped armature, since embodied in the machines of Gramme and Brush. It was originally constructed as an engine to be driven by a current from without; but it was also used as a generator of electricity, and both these uses of it were described in a paper in the *Nuovo Cimento* in 1864. The machine contains an iron ring like an anchor ring, round successive portions of which are wound coils of insulated copper wire in depressions cut in the ring to receive them. The intervening portions of the ring are thus (as in the Brush machine) enabled to come very nearly into contact with the surrounding fixed magnets. These consist of two half rings which are the pole pieces of two straight electro-magnets. The coils above mentioned are connected in a series, and their junctions are in connection with the several segments of a commutator, as in the Gramme machine.

The second machine was constructed in 1873, and described in the *Nuovo Cimento* in 1874. It is a generator of electricity, of the kind now known as the shunt dynamo—that is to say, the current generated is divided in parallel circuit between the fixed electro-magnet and the external resistance. This is done by means of two pairs of brushes making contact with different sections of the revolving commutator. The ring is replaced by a flat cylinder, across which the succesive coils are wound in depressions made for the purpose, the directions of winding being the same as in the Siemens continuous current machine, which was invented about the same time. The connections of the successive coils with one another and with the segments of the commutator are the same as in the first machine.

The third machine, which was constructed in 1878 on a model dating from 1875, is of a type of which, so far as we know, it is the only example. The idea of it is taken from the well-known experiment (Arago's rotations) in which a revolving horizontal copper disk causes a large magnetized needle balanced above it to revolve in the same direction. The explanation of the effect was first given by Faraday. It depends on the action of a current generated in the copper disk by its motion in the magnetic field due to the needle. The strongest current flows along that diameter which is parallel to the needle, and the current is completed through the circumferential portions of the disk. Pacinotti virtually cuts away all except the diametral portion and one of the two circumferential portions; in other words, he takes a wire and bends it into the shape of the letter D. This is one convolution of his revolving coil; the next is like the same D tilted a little; the next is tilted a little more, and so on; the straight part of the wire passing through or nearly through the axis of the coil, and the curved part being in the circumference. There is no room for a core in the ordinary sense, as the wires occupy nearly the whole interior space; but pieces of iron are so disposed partly within and partly without the coil as to serve the purpose of a core, by increasing the induction of the fixed magnets.—*Nature*.

Bonnefin's Sugar Process.

Mr. Bonnefin does away with the cane mill, of which one-third of the power is wasted by putting it into motion, and the other two-thirds are unprofitably used in crushing the cane so imperfectly that a proportion of juice, equal to half the quantity extracted, is left and lost in the megass. He substitutes in its stead his "pulpifactor," which consists of two series of vertical saws specially made for cutting sugar canes, and fixed to two frames, the whole working by a reciprocating motion with but small power to lift the tool, which afterwards precipitates itself with its own power, increased by its weight and velocity. Each series of saws reduces at one stroke a bundle of ten canes into slices. These slices, falling into a disintegrator running at high speed, are reduced into a fine pulp, which is pressed by means of two small rollers. The whole of the juice is thus forced out of the cells, and the woody matter is removed in a dry state. The juice thus extracted is mixed with lime as each gallon is produced, and in a proper proportion as it runs to a continuous preparator, when it is heated in a few minutes up to 95° C., or 203° Fah., but never beyond this temperature. During this short time it is cleared of all the suspended matters. This is effected by passing the juice over a table constructed with a series of corrugations forming a long continuous passage, the heat being applied beneath the table. The suspended matters settle by gravitation and are deposited in pockets placed at intervals along the route the juice has to travel.

The juice is now in a favorable state of lightness, fluidity, and temperature for effective filtration in Mr. Bonnefin's capillary elastic filter. This filter consists of a series of metallic rings covered with India-rubber, the internal diameter being twelve inches. The rings are placed horizontally in a press, and over each alternate ring is hung a filter cloth made of pure unspun cotton of the finest fiber. The rings and cloths are closely pressed and held together by means of screws, their number being governed by the rate of filtration required. The sirup is pumped into the press and passes through the whole series of rings and cloths, the solid impurities being intercepted and retained by that portion of the filter cloth which covers the opening in the ring, while the sirup passes by capillary attraction through the surrounding portions of the cloth, and is delivered in a perfectly pure and clear condition at the outlet. The purified juice on leaving the filter is ready for treatment either in the ordinary way, by the vacuum process, or by Mr. Bonnefin's evaporator and concentrator, in which the process of crystallization is much more rapidly performed. In the evaporator the juice is quickly deprived of its contained water, while the concentrator brings it into the condition of sound sugar in a very short space of time. It is claimed by Mr. Bonnefin that by his process all the operations, from the moment the cane is placed in the pulpifactor to the time of the crystallization of the sugar, do not occupy more than one hour. This shows a marked advance upon the ordinary process, which occupies from six to twelve hours. The following are the chief advantages in favor of Mr. Bonnefin's process: With his pulpifactor and accessories he claims to extract from the cane all the saccharine juice. With his continuous preparator, he prevents acidity or fermentation, clears the juice of all the suspended matters, and prepares it for the operation of purification or refining. With his capillary filter he completely purifies the juice, and utilizes all sediments and any washings of the factory. His aim is to make direct from the cane only one quality of sugar, that is, pure white refined sugar, to obtain the uncrystallizable sugar clear and bright, notwithstanding the coloring matters and the foreign salts, and to do this with a palpable economy of time, labor, fuel, machinery, and buildings.

A REMEDY FOR HICCOUGH.—Dr. M. S. Leslie, of Lexington, Ky., says that the best remedy in ordinary hiccoughs is about twenty-five grains of common table salt, placed in the mouth and swallowed with a sip of water.

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AGRICULTURAL INVENTIONS.

Mr. Isaac S. Bates, of Minonk, Ill., has patented an improved fender attachment to cultivators. In this improvement, the beam of the cultivator has combined with it a laterally adjustable clamping plate having upper and lower eyes, and united by screws with a clamping plate on the under side of the beam. Through these upper and lower eyes, a rod capable of being raised or lowered is passed and pivoted at its lower end to the upper middle portion of the fender, which is connected at its end by a hooked rod with the axle or frame of the cultivator. This construction not only admits of a lateral adjustment of the fender in both directions, but also of its vertical adjustment, to suit the height of the corn or other plants in the row, and it has a free connection with the rod which provides for its vertical adjustment. Although here only one beam is referred to, the invention is of course applicable to the series of beams in a wheel cultivator.

Mr. Oren Stoddard, of Busti, N. Y., has patented a combined hand seed planter and fertilizer distributer, which has a very perfect action and separates the fertilizer from the seed in the ground. In this device, a central box in which phosphate or other fine fertilizer is placed has combined with it outer side boxes for reception of the corn or other seed. Followers terminating in or connected with a handle above, serve, by a suitable construction of the interior of the boxes, to discharge, as they are thrust downward, the fertilizer and seed in measured quantities into the ground, the same passing out through or between elastic plates which form the necessary openings in the soil, while the bottom of the boxes act as a stop to insure the seed being planted at a uniform depth. By this construction the seed for each hill will be divided, and the fertilizer will be deposited in the space between the parts of the hill without being in contact with the seed, so that the seed will not be injured or killed by the fertilizer. Connected with the fertilizer follower are levers, having attached covering plates which, as said follower is drawn upward, force the soil into the openings in which the seed and fertilizer have been deposited, and cover the seed.

Mr. Ludwig Silland, of Edwardsville, Ill., has patented an improved harrow. In this improvement the harrow proper is made up of several interchangeable duplicate sections. The invention consists in the peculiar construction and arrangement of the draught devices and connecting links, whereby the draught can be applied to two or more sections of the harrow as desired. To this end the draught beam is transversely divided into two sections united by detachable plates. One of these sections is permanent and the other removable. On the permanent section, at about the middle of the length of the entire beam, is an eyebolt, and near either end of the beam are corresponding eyebolts. A link connects the eyebolt at the end of the removable section with a central draught ring that is attached by a hook to the central eyebolt fast on the permanent section. Said ring is also connected by another hook with a second ring which is attached by links to the middle and end eyebolts on the permanent section of the beam. By this construction, when it is desired to use three harrow sections, the pull is made on the central ring, but when the removable section of the beam and one harrow section are detached, then the hooks are disengaged and the draught is made on the other ring. The invention has much merit.

An improvement in cultivators, patented by Mr. Johann C. F. Hammer, of Cullman, Ala., has no small amount of merit. The object of this invention is to furnish cultivators so constructed that the plows can be adjusted to keep them parallel with the line of draught. To this end the standards of the plows which are connected with the side beams are journaled at their upper ends to turn in said beams and secured by clamp nuts at their tops, and the braces of the plows are bent to one side at their upper ends and there notched, and pass through eyebolts which project up through the side beams, and are held by clamp nuts on the tops of said beams. With this construction, by loosening the clamp nuts of the standards and braces of the plows, the latter can be adjusted parallel with the line of draught whatever be the inclination of the side beams, so that the plows will always work squarely in the ground.

Memory in Chess Playing.

Wonderful as are the feats of chess-players, who can work out a game or a series of games without seeing the board, there is nothing really remarkable in them. When once mastered, the trick is not only fairly easy of performance, but the fact that the process is purely mental rather facilitates than impedes the action of the mind. To the "blindfolded" chessplayer there is present a mental picture of the board with the pieces in position. He can change the position of the men as easily as he can think, and after he has once mastered the difficulty of fixing the mental picture, it is distinctly before him. Some players, who do not in their common process of memory use picture phantoms, work out the moves as algebraical propositions are occasionally worked, by phantoms of sound; but, as a rule, chess-players are mental-picture-readers, and can at pleasure call up any one of several pictures of boards as they last conceived them. The most difficult feat, and one which very few mental chess-players can accomplish, is to play two or three games simultaneously, the moves made by their opponents being told them in close sequence and their own moves being directed after all the reports of the proceedings of their opponents have been received. Thus, if there be several players against the one mental player, he must be told and remember what each of his adversaries has done *before* he begins to give the instructions for his several counter-moves. In this exploit the most perfect development of the mental faculty of distinct picturing and the displacement and recall of mental pictures at will is exhibited. The prodigious difficulty of the feat can only be realized in the attempt to perform it. Even the expert blindfolded chess-player can rarely succeed in accomplishing the performance we have attempted to describe.—*Lancet.*

Alaskan Mines.

We had a conversation the other day with Col. A. F. Williams, of Oakland, who has recently returned from a prospecting voyage in Northern Alaska. From him we learn some interesting facts concerning the mining resources of the region. Col. Williams left here with a party, on a schooner, in May last. They went up through the Aleutian islands and through the Behring Sea into Norton Sound; but most of the time was spent in Golowin Bay, on the north coast of Norton Sound. Here are high rocky mountains, steep and abrupt, though there are large prairies next to the coast.

Col. Williams went with a whale boat 100 miles up the Fish River and sent a party overland. A land party also traversed the region, and quite an extent of country was located.

The principal location made was a galena lead or deposit. We have seen assay certificates by Prof. Price, giving the value at 83 per cent and 85 per cent lead, and $121 and $161 silver. This is almost pure galena, that containing 86 per cent lead.

Col. Williams says the Esquimaux utilize this by putting a piece in the bullet mould and running lead around it, to make bullets.

The country all about the region visited by Col. Williams and party is a very difficult one to prospect in, but this is not on account of the heavy timber, as most people suppose. This heavy timber is more prevalent in the southern part of the Territory. But there is a heavy coat of moss covering the whole face of the country, making it very hard to get about. In fact, it is a most villainous country to get about in. The moss is from one to two feet thick, and the ground is more or less boggy, so that if one steps off the moss bed, he is apt to get into the bog. Ten or twelve miles is a good day's travel, so it is very hard to prospect.

There are belts of timber here and there, but the mountains are generally barren and free from brush and trees. Yet there is timber here and there, and plenty for fuel or mining purposes.

The country rock is mainly a micaceous slate; but no gold was found. The mountains seem to be of a white spar, which some suppose to be lime. There are great dikes of granite extending for miles and miles. No sulphurets of iron were found anywhere. There is plenty of mica in great scales and sheets.

The schooner was taken into Golowin Bay and there anchored. The prospecting expedition went out from this point. They were in 64·30° N. and 163° W. Overland, they were not more than 50 miles from Kotzebue Sound, in the Arctic.

Col. Williams judges this to be a good mineral region. The Esquimaux talked a good deal of the lead mines they knew of elsewhere. He has no doubt there is a good deal of mineral thereabouts.

The expedition left here on the 5th of May last, and met the ice on June 1. They coasted around Norton Sound some 200 miles. There are a couple of thousand Esquimaux camping around the shores of the sound. The party found them very generally willing to do anything asked of them. These natives packed the ore down to the vessel from the mine, some 15 tons being taken out for shipment.

When they return in the spring, horses will be taken up and sleds will be used for hauling ore. There is plenty of feed and hay along the coast.

They have an average of good weather in the summer, about as they have it in New York. August is wet but not cold. The first frost came on September 15. In June the sun was out of sight about two and a half hours; it was broad daylight and no stars to be seen for two months. There are five good working months for surface work, and when once underground deep enough, the men can work all winter. There is timber within half a mile of the mine, so there is no difficulty in building houses to make the men comfortable. Col. Williams says the ore can be put down here in San Francisco at a cost not to exceed $50 per ton, It is unnecessary to reduce it at the mine, as there is over 1,600 lb. of lead to the ton of ore.

Col. Williams had met some men who had come from 1,500 miles up the Yukon River. Up there they had been making from $10 to $15 per day to the hand in placer mines. They can only work about four months in the year. A little stern-wheel trading steamer now runs up the Yukon, to about 1,800 miles from the mouth. She only makes two trips a year. Her timber was got out here, and she was put together at St. Michaels.

There are only four white women in the Territory north of Kodiak. One lady is at St. Michaels, and she told Col. Williams that it was no colder there than at her native place, Portland, Maine. There is also a Chicago lady four miles from St. Michaels. There is one at Ounalaska, the port of entry, 2,100 miles from here, and one on the Island of St. Paul.

Col. Williams says there is an abundance of plumbago all through that country. His party is the first that ever visited that region. At the mine they sunk twenty feet, but did not get through the frost—the frozen ground. The heavy coat of moss seems to protect the ice, as ice is protected in sawdust and blankets. The tops of the mountains are free from the moss. The mosquitoes are innumerable and very annoying, fiercely contesting their rights to the country. They seem to breed in the ice.

When the party started away, they stopped with their vessel to get water, and while at anchor a severe gale drove the vessel ashore and wrecked her, she being a total loss. The Esquimaux took the party to St. Michaels in skin canoes, where some of them joined the revenue cutter Corwin, and were brought to this port.—*Min. and Sci. Press.*

Lime as a Preservative.

Lime, it is well known, preserves ironwork; and Wren, in his "Parentalia," mentions the freshness of iron cramps which had been bedded in mortar for 400 years. It is usual to limewhite iron mains, tanks, and other articles to prevent rust; and bricklayers are in the habit of smearing their trowels with mortar. In the demolition of old buildings the ends of joists, ceiling-laths, quarters, plates, and bond timber which have been bedded in lime-mortar, are usually found in a sound condition, in spite of their having been bedded all round. Higgins, in his well-known treatise on "Calcareous Cements," now rather an antiquated work, speaks of the value of lime-water or water freed from "acidulous gas." Something of this protection is rendered to wood and iron which are covered with lime. It is well known that an alkaline solution prevents corrosion of iron; and Mallet, in his work on "The Action of Air and Water upon Iron," proposed lime-water to replace bilge-water, and thus prevent the internal corrosion in iron ships. Lime has a powerful affinity for oxygen, and to this cause may be attributed its preservative effects upon iron and other materials.

It would be interesting to record the many evidences of the value of lime in arresting decay. As long ago as 1769 a Mr. Jackson, a chemist, obtained permission to prepare timber for the shipyards, by immersing it in a solution of salt water, lime, muriate of soda, etc.; another practical experimentalist suggested slaked lime, thinned with a solution of glue, for mopping the timbers of a ship. The preservation of timber has been attempted by surrounding it with pounded lime, and several attempts have been made to preserve timber by the use of lime. Mr. Britton, in his work on "Dry Rot," mentions a number of cases where lime has been of service. He says "quicklime with damp has been found to accelerate putrefaction in consequence of its extracting carbon; but when dry and in such large quantities as to absorb all moisture from the wood, the *wood is preserved* and the *sap hardened.*" "Vessels long in the lime trade have afforded proof of this fact, also examples in plastering laths which are generally found sound where they have been dry." The joists and sleepers of basement floors are rendered less subject to decay by a coating of limewhite; and this might be renewed at intervals. The same writer adds, "it does not appear practicable to use limewater to any extent for preserving timber, because water holds in solution only about 1-500 part of lime, which quantity would be too inconsiderable; it, however, renders timber more durable, but at the same time very hard and difficult to be worked."

These facts are instructive; they show, at least, that lime in a sufficient quantity kept dry is a valuable preservative agent, and some practical chemist might earn a deserved repute if he could prepare a lime solution that would be capable of rendering so substantial a service to all builders. Such a solution would be at least sufficiently remunerative to make it worth while to try a few experiments in this direction.

It is stated on good authority that the white ant in India costs the government £100,000 a year for repairing woodwork, bridges, etc., caused by its depredations. Concrete basements have been found to resist the encroachments of the ant. Dr. Darwin proposed a process of timber preservation some years ago, in which an absorption of limewater was effected, and after that had dried, a weak solution of sulphuric acid, so as to form sulphate of lime in the pores of the wood. The growth of dry-rot or fungus on timber has been prevented by limewater, and many instances have been mentioned of its value.

The cleansing and sanitary virtues of lime are more generally known. The painter uses limewater to kill the grease upon his work instead of turpentine; and soot stains on the outside of flues have been removed by the agency of thick warm limewash. The value of limewhite as a wash for walls, as a purifier of the air in sheds, stables, and other buildings is unquestionable, though all limewashed roof-timbers have rather a rough and penurious look. As a preservative coating to the joists of floors and other timbers not exposed to damp, it seems worthy of a more extended trial. —*Building News.*

HOLLOW STEEL SHAFTING IN FRANCE.—Hollow steel shafting is being introduced into France. It is made by casting the metal around a core of lime, the ingot being finally rolled into shafting, the lime core going with it and diminishing in diameter in the same proportion as the metal, even when the total diameter is reduced as low as one-fourth of an inch.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

To Users of Steam.—No one using steam can afford the loss of fuel and power consequent upon the use of inferior non-conducting steam pipe and boiler coverings. Asbestos has proven the most effective and economical material for the purpose, and is employed in the form of a cement and a fireproof felt for a lining or insulator under hair, felts, etc.

The genuine Asbestos Cement Felting consists of fine long Asbestos fibers and a cementing compound which forms a light, porous, fireproof covering, partaking of the nature of a felt and a cement. It is prepared ready for use, can be easily applied by unskilled workmen, and forms the most effective, durable, and economical non-conducting covering in use for steam pipes, boilers, and other heated surfaces.

The genuine Asbestos Air Chamber Covering consists of an insulating lining or a sheathing made of pure Asbestos, combined with a thick felt or wadding of pure Asbestos, to be applied directly to heated surfaces and covered with one or more layers of hair felt and an outer layer of Asbestos sheathing, thus securing the advantages of hair felt without the liability of its being ignited or charred by fire. The great advantage of the genuine Asbestos coverings for steam pipes, boilers, etc., over any other forms of non-conducting coverings, aside from their economy, superior effectiveness, and fireproof qualities, is that they are manufactured in convenient form ready for use, and can be easily applied without the aid of skilled labor. The H. W. Johns M'f'g Co., 87 Maiden Lane, N. Y., are the sole manufacturers.

Partner Wanted—With small or large capital. Inclose stamp to Box 36, Kent City, Mich.

For Sale.—1 Engine Lathe, Fitchburg, 7½ ft. x 15 in.; price, $250. 1 Iron Planer, planes 7½ ft. x 34 in. x 30in.; price, $550. Address Concord Axle Co., Fisherville, N. H.

A. C. E., four years on the Midland Railway, England, and ten years constructing and working railways in British India, desires employment. Good draughtsman and surveyor. Address Assoc. M. I. C. E., Mount Athos, Campbell Co., Va.

Wanted—Situation by a Gold, Silver, and Nickel Plater; 22 years' experience. Address Plater, Oakville, Ct.

Blake's Belt Studs. The strongest fastening for old and new belts. Greene, Tweed & Co., 118 Chambers St., N. Y.

Workshop Receipts.—A reliable Handbook for Manufacturers and Mechanics. $2, mail free. Ornamental Penman and Signwriter's Pocketbook of Alphabets. 20 cents. E. & F. N. Spon, 446 Broome St., New York.

For Sale.—Patent on Ice Machines. W. J. Lyons, Decherd, Tenn.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Mailed free. Catalogue of Books for Engineers. Theoretical and Practical. E. & F. N. Spon, 446 Broome St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Telegraphic, Electrical, and Telephone Supplies, Telegraph Instruments, Electric Bells, Batteries, Magnets, Wires. Carbons, Zincs, and Electrical Materials of every description. Illustrated catalogue and price list, 72 pages, free to any address. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Walrus Leather, Walrus Wheels, Emery, and Glue for Polishers. Greene, Tweed & Co., 118 Chambers St., N.Y.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

For Sale—A complete set of Patterns, Flasks, and Core Arbors, for making Cast Iron Flanged Pipe, Elbows, Tees, and Greenhouse Fittings. Will be sold low to clean out a branch of a business. Address C., Box 1358, New York.

Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N. H.

Foot Lathes, Fret Saws, 6c. 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Punching Presses & Shears for Metal-workers, Power Drill Presses. $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

The Best constructed low priced Engines are built by E. E. Roberts, 107 Liberty St., New York. Communicate.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro. 234 Broadway, New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss. Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Peck's Patent Drop Press. See adv., page 333.

Learn Telegraphy. Outfit complete, $4.50. Catalogue free. J. H. Bunnell & Co., 112 Liberty St., N. Y.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C. Forsaith & Co., Manchester, N.H., and N.Y. city.

Saw Mill Machinery. Stearns Mfg. Co. See p. 333.

Cope & Maxwell M'f'g Co.'s Pump adv., page 334.

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C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 348.

Common Sense Dry Kiln. Adapted to drying all of material where kiln, etc., drying houses are used. See p. 350.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Silica Paints (not mixed); all shades. 40 Bleecker St., N.Y.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Ball's Variable Cut-off Engine. See adv., page 364.

Paragon School Desk Extension Slides. See adv. p. 366.

Brass & Copper in sheets, wire & blanks. See ad. p. 364.

The None-such Turbine. See adv., p. 350.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

Berryman Feed Water Heater. See illus. adv., p. 366.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 365.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser Mfg. Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 365.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 366.

Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions, Sunday schools, colleges, and home entertainment. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., New York.

Draughtsman's Sensitive Paper. T.H. McCollin, Phila., Pa.

New Economizer Portable Engine. See illus. adv. p. 366.

Combined Concentric and Eccentric Universal and Independent Jaw Chucks. The Pratt & Whitney Co., Hartford, Conn.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

The Sweetland Chuck. See illus. adv., p. 366.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N.J.

Skinner's Chuck. Universal, and Eccentric. See p. 365.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

For Machinists' Tools, see Whitcomb's adv., p. 366.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) I. P. F. writes: I have a four-foot drum beneath the floor. Can I belt to a twelve-inch pulley overhead at right angles to it, both horizontal, and have it work satisfactory? A. Yes.

(2) L. J. K. asks how lacquer is made, applied to brass, etc., so as to produce the smooth and permanent polish seen upon fine electrical and optical instruments. I have often tried various recipes, but have always failed in producing good results. A. For receipts for lacquers, see page 209, vol. xliv. Heat the articles to be lacquered, and lay on a thin even coat of the lacquer quickly. If it is small, so that the lacquer chills it, it is better to lay on a very thin lacquer, expose the piece in a japanner's oven at a moderate temperature until the varnish has dried and fused, and then apply another coat and heat again to produce the requisite gloss and finish.

(3) A. E. B. writes: In tracing out the connections in the switch used with the magneto machine, illustrated on your front page last week, I find that the plate 14 is connected with plate 4. Is this correct? Should not 14 be connected with 13? A. 14 should be connected with 13. The mistake is one easily made by the artist. It was noticed and corrected before the printing of the edition was far advanced.

(OFFICIAL.)

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November 8, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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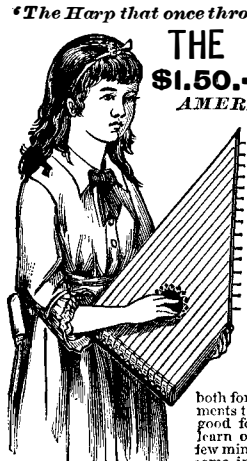

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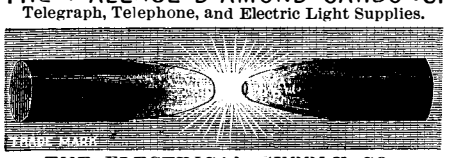

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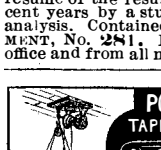

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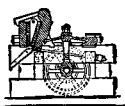

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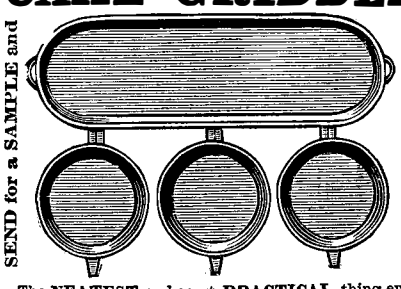

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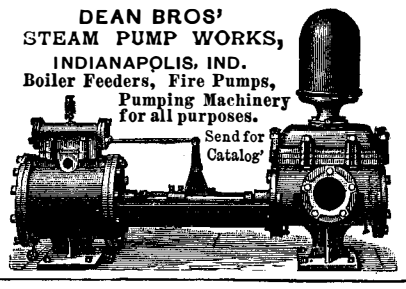

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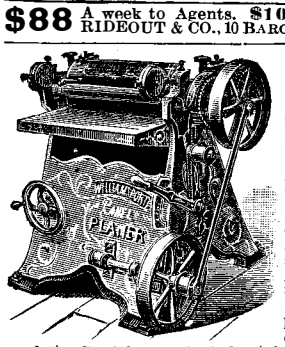

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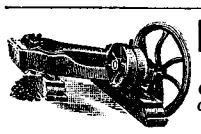

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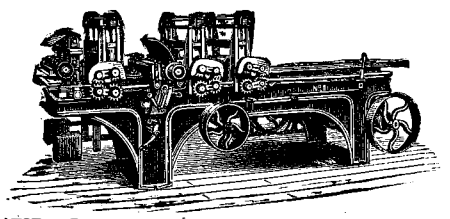

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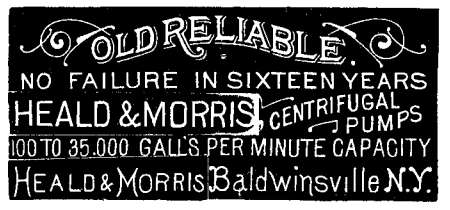
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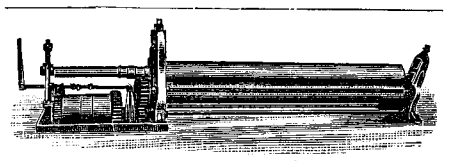

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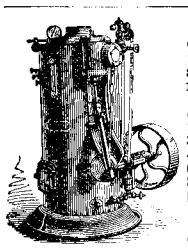

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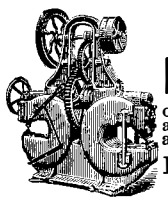

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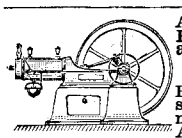

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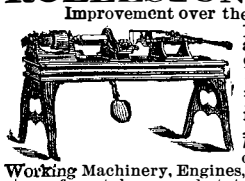

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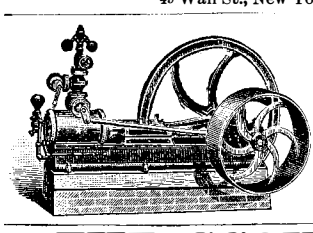

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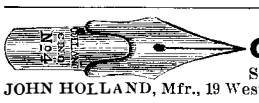

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